

PISCES.

By EDGAR R. WAITE, F.L.S.

PART II.

Plates XXIV.—LVII. and figs. 1-3.*

This, the second and concluding portion, is devoted to the teleostean fishes, the new genera and species, with few exceptions, and known forms not hitherto recognised from New Zealand, having been briefly recorded elsewhere¹.

They may be summarised thus:—

NEW GENERA.

Maccullochia for *Histiopertus labiosus* Günther.

Rexea for *R. furcifera* sp. nov. and others.

Pelotretis for *P. flavilatus*, sp. nov.

NEW SPECIES, ETC.

Centriscops humerosus Rich. var. *obliquus*.

Syngnathus norae.

Coelorhynchus aspercephalus.

Cepola aotea.

Pseudolabrus pittensis.

Rexea furcifera.

Rhombosolea millari.

Ammotretis nudipinnis.

Pelotretis flavilatus.

Hemerocoetes microps.

Other additions to the fauna are:—

Chlorophthalmus nigripinnis Günther.

Macrorhamphosus scolopax Linnæus.

Zanclistius elevatus Ramsay and Ogilby.

Pterygotrigla picta Günther.

Gnathagnus innotabilis Waite.

(1) Waite Proc. N.Z. Inst. 1910 pp. 25, 26, and 1911 pp. 49—51.

*For explanation of plates see p. 270

Though many of the species dealt with have previously been illustrated by outline figures, these cannot be regarded as satisfactory, and the opportunity has been embraced of refiguring a number of them.

Further, an attempt has been made to supply an oft expressed deficiency in the matter of descriptions, many of the earlier ones in especial, being scarcely recognisable, and in order to facilitate the identification of species, consultative keys have in places been supplied at the request of persons more or less interested in our fishes. Such aids are more properly regarded as appertaining to a manual or hand-book but no such work is yet available.

Finally, at the request of Mr. L. F. Ayson, Chief Inspector of Fisheries for the Dominion, and officer in charge of the trawling expedition, I have dealt somewhat fully with the *Pleuronectidae*. The flat fishes have never been adequately examined, and as a preliminary effort I have given some attention to the subject. I believe that as a result, their recognition will be much simpler than heretofore.

ISOSPONDYLI.

Family CLUPEIDÆ.

- a. Body feebly compressed, belly rounded, ventral
scutes weak, vertebræ 50 to 56 *Clupea*.
- aa. Body strongly compressed, belly acute, ventral
scutes strong, vertebræ 40 to 44 *Harengula*.

CLUPEA Linnaeus, 1758.

CLUPEA NEOPILCHARDUS Steindachner.
PILCHARD.

Clupea neopilchardus Steindachner, Denk. K. Akad. Wiss. xli., 1879, p. 12.

Clupea sagax Arthur, T.N.Z.I. xv., 1883, p. 208, pl. xxxiv.

Stations 78, 81 (167).

B. vii.; D. 20; A. 19; P. 16; V. 8; C. 12 + 20; Sc. 52; Sc. tr. 11; Vert. 19 + 31 = 50.

Length of head 3.6, height of body 4.9, length of caudal 8.9 in the length; diameter of eye 4.4, interorbital space 6.2, and length of snout 3.1 in the length of the head.

Head compressed, flat above; adipose eyelid well developed, both before and behind; nostril on each side, single, placed a

little nearer the end of the snout than to the eye. Lower jaw slightly the longer, cleft of mouth oblique, the maxilla extends to beneath the first third of the eye; gill openings wide, gill-rakers thin, long and slender, ninety-four on the first arch, of which sixty-seven are on the lower limb.

Body slightly compressed, belly rounded, abdominal scutes not much developed, nineteen in front and fourteen behind the origin of the ventral fin.

Teeth.—None.

Fins.—The origin of the dorsal is nearer to the end of the snout than to the base of the caudal, the longest rays are one-half the length of the head; the distance between the origin of the anal, and that of the dorsal is equal to the distance between the latter and the front margin of the eye; pectoral low, its length equal to the head less the snout; ventral placed posterior to the middle of the dorsal, its length equal to the distance between the end of the snout and the middle of the eye or 2.7 in the length of the head; caudal deeply cleft, the height of the peduncle one-half greater than the diameter of the eye.

Colours.—Back dark-blue, sides silvery, details cannot be ascertained owing to the poor condition of the specimen.

Length.—179 mm.

The Pilchard was not actually trawled during the period I was on the vessel, but was obtained from the stomachs of *Macruronus novae-zelandiae*. Mr. Anderton sent me three examples taken at Station 167, in Golden Bay, at the northern extremity of the South Island; the depth recorded is 16-17 fathoms but the fishes had evidently been ejected by some other fish as they are partially digested.

If properly fished for, the pilchard should prove a most valuable source of food, for it is evidently common on both the Australian and New Zealand coasts. Hector² stated that it visits the east coast of Otago every year in February and March, and when the schools migrate they extend as far as the eye can reach, followed by a multitude of gulls, mutton birds, barracouta, and porpoises. So densely packed are they in some years, that by dipping a pitcher in the sea, it would contain half fish; so that if large boats and suitable nets were employed, thousands of tons could be caught.

(2) Hector, Edible Fishes N.Z. 1872, p. 119.

HARENGULA Cuvier and Valenciennes.

HARENGULA ANTIPODA Hector.

SPRAT.

Clupea sprattus, var. *antipodum* Hector, Cat. Fish. N.Z., 1872, p. 133. Arthur, T.N.Z.I. xv., 1883, p. 203, pl. xxxiv., fig 1.

Clupea antipoda Hutton, Index Faunæ N.Z., 1904, p. 51.

Stations 6, 17, 33, 40, 41, 42, 45, 52, 53, 86, 87.

B. vii. D. 16; A. 16; V. 8; P. 15; C. 20 + 12; Sc. 47. Sc. tr. 13; Vert. 22 + 22 = 44.

Length of head 3.8, depth of body 3.27, length of caudal 7.5 in the length; diameter of eye 3.8, interorbital space 5.3, length of snout 3.25, mandible 1.9, pectoral 1.44 in the head.

Head compressed, flattened above, eye a little deeper than long, mouth sub-vertical, the lower jaw projecting, mandible almost covered by the maxillary, which is strongly bowed, very broad, and extends to beneath the first third of the eye; gill openings large, the membranes not attached to the isthmus, gill-rakers long and slender, fifty-nine on the first arch, of which thirty-seven are on the lower limb.

The body is compressed but thick above, passing into the sharp belly, the dorsal profile is slightly convex, the ventral profile markedly so.

Teeth.—Very weak, in the jaws, on the vomer, palatines and tongue.

Fins.—The origin of the dorsal is situated a little nearer to the base of the caudal rays than to the end of the snout, the base of the fin is equal to the length of the pectoral; anal fin short, the distance of its origin from the caudal much less than the length of the head; pectorals low; ventrals small, nearly twice the diameter of the eye, and placed below the third or fourth dorsal ray, caudal deeply cleft, the depth of the peduncle is one-half greater than the diameter of the eye.

Scales.—Head naked, the body scales are thin and deciduous, each of the abdominal scutes produced into a sharp spine, twenty-two being in advance of the ventral fins, and twelve thence to the anal.

Colours.—Back dark green, sides silvery, the dividing line being very marked and quite straight except near the caudal, the dark tint occupying the whole base of the caudal; fins colourless.

Length.—120 mm.

This herring was taken along the whole of the coast line explored, though it is improbable that it was trawled from the bottom, the specimens being more likely entrapped as the net was hauled to the surface: hundreds were washed through the large meshes, all appearing to be dead, their delicate bodies being unable to withstand the pressure to which they were subjected; most of the examples preserved were skimmed off the surface with a hand net.

Mr. W. Arthur collected some very interesting information on the habits of the sprat, publishing it in the paper above noted.

Captain J. Bollons of the Government steamer "Hinemoa" has sent me this species from Auckland Harbour.

Family ARGENTINIDÆ.

ARGENTINA Linnaeus, 1758.

ARGENTINA ELONGATA Hutton.

SILVERSIDE.

Plate XXIV.

Argentina clongata Hutton, Ann. Mag. Nat. Hist. (5) iii., 1879 (Jan.), p. 53. Günther, Chall. Rep. xxii., 1887, p. 218, pl. lv., fig. B.

Argentina decagon Clarke, T.N.Z.I. xi., 1879 (May), p. 296, pl. xiv.

Stations 16, 17, 19, 20, 21, 22, 23, 25, 26, 38, 50, 67, 74, 75, 81, 83, 85, 88, 89, 90.

B. vi.; D. 11; A. 12; V 12; P. 15; C. 20 + 12; L. lat. 57; L. tr. 4 + 5; Vert. 54.

Length of head 3.64, height of body 6.37, length of caudal 4.93 in the total: diameter of eye 3.0, interorbital space 6.0 in the head.

Head long, slightly deeper than wide, nearly flat above; the eye is very large, cutting the upper profile, and leaving less than half its vertical diameter below: the snout is pointed, one-sixth longer than the eye; the nostrils are close together, the anterior one being a large round pore, situated midway between the end of the snout and the eye: the mouth is small and sub-horizontal, the upper jaw is a little the longer, and the maxilla reaches slightly more than half way to the eye; gills four, a slit behind the fourth; gill rakers moderate, very slender, thirteen

on the first arch, ten being on the lower limb, pseudobranchiæ feebly developed.

Body elongate, slightly compressed, with three longitudinal ridges, especially well-marked posteriorly, one ridge above, and two below the lateral line; the width of the body is three-fourths its depth, it is flattened above and below anteriorly, less so behind.

Teeth.—No teeth in the jaws, some minute teeth at the end of the vomer, and seven larger curved teeth on the tongue, near its tip.

Fins.—The dorsal fin originates midway between the end of the snout and the hinder insertion of the adipose fin; the first ray is less than half the length of the second, which is the longest, and equals the length of the snout plus the eye, the length of the base equals the diameter of the eye, the extreme length of the adipose fin being the same; the latter is situated over the middle of the anal; the anal is lower than the rayed dorsal; the pectoral is placed low, and is longer than the ventral, the latter originates beneath the penultimate ray of the dorsal; the caudal is forked, and has many short rays above and below, extending forward more than one-third its distance to the adipose fin; the peduncle is twice as long as deep, or one-third greater than the diameter of the eye.

Scales.—Head naked, the scales on the body are large and deciduous, those of the lateral line more adherent; these, as are also those of the three longitudinal ridges, notched in the centre. The lateral line dips slightly in front thence runs straight to the base of the caudal.

Colours.—The body is yellowish or silvery, with very pale-brown semi-cross bands, at least in the young, three before the dorsal, one at its base, three between this and the adipose fin, and one between the latter and the caudal: they do not extend below the lateral line. There is also a polished silvery band along the middle of the sides; eye blue with a silver patch above the pupil.

Length.—184 mm., attains to 191 mm.

The Silverside was generally obtained in all waters from Otago to the Bay of Plenty, also at the Chatham Islands and at depths between the extremes of 16 and 105 fathoms. A single example taken at Station 75 was voided by a Red Cod (*Physiculus bachus*).

The respective descriptions of Hutton and Clarke apply to the same fish, and were published within four months of each other, the name *A. elongata* having priority.

Günther considered *A. decagon* as a synonym of *A. sphyraena* Linnaeus, and regarded *A. elongata* as distinct. The type was a young example, and an examination of my series shows that in small specimens the head is relatively longer and the body less deep than in larger ones. Günther appears to have had the type specimen, which is doubtless in the British Museum, but the respective descriptions of Hutton and Günther vary somewhat, thus the former gives the depth of the body as 9 times in the length, the latter 8. The eye is rendered as $3\frac{1}{2}$ and 4 times in the length of the head respectively; I have specimens showing the former proportion. In neither the depth of the body nor the diameter of the eye, does Günther's figure quite agree with his description. Under these circumstances, and seeing that I have specimens from the type locality, I cannot but regard my examples as identical with this species.

Clarke's specimen was larger, and I have small hesitation in regarding mine as of the same species; though the relative position of the nostrils, as described, is different. As above mentioned, Günther has identified this, apparently from the description only, with *A. sphyraena*. Our specimens have 54 vertebrae, while the northern one is said to possess but 50.

Günther writes:—"The three Atlantic species known are very similar to each other in their organisation, and, therefore, we may infer that they agree very much in their habits. They live at a considerable depth, but probably at some distance from the bottom, as they have never been captured by the dredge or trawl during any of the deep-sea expeditions." Additional species, made known since this was written have been taken in the dredge, while all our numerous examples were captured in the trawl. Specimens taken at the northern stations were ready for spawning, the roe being small and colourless.

APODES.

Family ANGUILLIDÆ.

CONGERMURÆNA Kaup, 1856.

CONGERMURÆNA HABENATA Richardson.

LITTLE CONGER EEL.

Congrus habenata Richardson, Voy. Ereb. and Terr., 1848, p. 109, pl. l., figs. 1-5.

Stations 7, 89.

The only examples of this species were obtained from other fishes, and were either thrown up or removed from their

stomachs. At Station 7 specimens were voided by Lings (*Genypterus blacodes*) and at Station 89 the Dories (*Zeus faber*) furnished several examples, in addition to *Cepola aotea* and *Myctophum humboldti*. All are too much digested to be useful further than for identification and for ascertaining the number of vertebræ, which I find to be $44 + 78 = 122$.

LEPTOCEPHALUS Scopoli, 1777.

LEPTOCEPHALUS CONGER Linnæus.

CONGER EEL.

Muraena conger Linnæus, Syst. Nat. ed. x., 1758, p. 245.

Stations 40, 51, 52, 72, 76, 77, 78, 80.

The Conger Eel was taken at Stations between Timaru and Porangahau Bay, south of Hawke Bay, and at depths from $9\frac{1}{2}$ to 28 fathoms. Some of the examples reached a length of 2060 mm. (= 6ft. 9in.).

The number of vertebræ has been variously rendered within close limits, a count of one of the trawled specimens yields $54 + 102 = 156$.

INIOMI.

Family SUDIDÆ.

CHLOROPHTHALMUS Bonaparte, 1840.

CHLOROPHTHALMUS NIGRIPINNIS Günther.

CUCUMBER FISH.

Plate XXV.

Chlorophthalmus nigripinnis Günther, Ann. Mag. Nat. Hist. (5) ii., 1878, p. 182, and Chall. Rep. xxii., 1887, p. 193, pl. li., fig. a. Waite, Mem. Mus. iv., 1899, p. 54, fig. 4.

Stations 88, 89.

B. vii.; D. 11; A. 10; V. 9; C. $19 + 12$; Sc. 55; L. lat. 51; L. tr. $5 + 6$; Vert. 47.

Length of head 3.44, height of body 5.21, length of caudal 4.91 in the total: diameter of eye 2.63, interorbital space 10.0 in the head, and one-fourth the diameter of the eye.

Head wider than deep, eye very large, cutting the upper profile, its cavity occupying the greater part of the head; inter-

orbital space concave, its edges forming low ridges; the snout is flat but pointed in profile, its length little more than half that of the eye; nostrils small, close together, slightly nearer the eye than the snout, the anterior with a flap behind; the mouth is moderate, slightly oblique and the lower jaw projects noticeably beyond the upper, the maxilla reaches nearly to beneath the middle of the eye, and its distal extremity is one-fifth greater than the interorbital space; gills four, a slit behind the fourth, pseudobranchiæ present.

Body sub-circular in section, with a ridge from the occiput to the beginning of the dorsal fin which stands on a slight eminence, lower surface of body rather flat.

Teeth.—A broad band of villiform teeth in the jaws; they extend outward over the lips, a large patch of similar teeth on the vomer, subcontinuous with a narrow band on the palatines; the tongue is spatulate and truncate, and bears teeth on the front and sides.

Fins.—The dorsal commences a little nearer the snout than the adipose fin, the first ray is half the length of the second, which is the longest, and more than four-fifths the length of the head, or one-third the height of the body, the remaining rays regularly decrease in length, the adipose fin terminates evenly with the anal, the rays of which are but three-fourths the diameter of the eye in length; the pectoral is equal to the ventral in length 1.4 in the head and reaches below the hinder insertion of the dorsal; caudal deeply cleft, the upper lobe one-third longer than the lower, peduncle long, and, except quite posteriorly, as wide as deep.

Scales.—Cheeks and upper part of opercle with scales smaller than those of the body, all cycloid and nearly smooth; the lateral line arises over the opercle and gradually attains the median line passing along the middle of the peduncle, minute scales along the ventral (which has an enlarged axillary), and caudal fins.

Colours.—Green above and silvery below; head green with brilliant silvery opercles, edge of premaxillary blue, upper lip black, dorsal fin and caudal lobes tipped with black, the colouring on the lower lobe of the caudal broader than on the upper; inner rays of ventrals clouded.

Length.—192 mm., attains to 210 mm.

When we first obtained the fish I recognised it as of the same species taken so commonly off the coast of New South Wales in 1898, and it is an addition to our marine fauna. *C. nigripinnis*

was but twice taken during the "Nora Niven" expedition, though each haul was fairly rich in individuals.

Our first two hauls, after rounding Cape Runaway, in the Bay of Plenty were practically continuous and produced this fish in depths ranging from 66 to 105 fathoms.

Some characters of this species were discussed in my report of the Fishes of the "Thetis" Expedition (*vide supra*) and need not be repeated here, the number of caudal rays there printed as 9 should have been 19. The word *Chlorophthalmus*, also, is misspelled.

The only species ascribed to this genus previously taken in New Zealand is *C. gracilis* Günther,³ which however differs so greatly from typical forms as to be quite unmistakable, and which indeed I would regard as a separate genus differing from *Chlorophthalmus* by its elongate body, smaller eye, long maxillary, and the forward position of the ventral fins.*

Family MYCTOPHIDÆ.

MYCTOPHUM Rafinesque, 1810.

MYCTOPHUM HUMBOLDTI Risso.

LANTERN FISH.

Plate XXVII., fig. 3.

Gasteropelecus humboldti Risso, Ichth. Nice, 1810, p. 358.

?*Myctophum boops* Richardson, Voy. Ereb. and Terr., 1845
p. 39, pl. xxvii., figs 13-15.

Myctophum californiense Eigenmann, West Amer. Scient., 1889,
p. 124.

Station 89 (*ex Zeus*).

B. viii.; D. 12; A. 21; V. 8; P. 12; C. 19 + 12; L. lat. 39;
L. tr. 3 + 4; Vert. 38.

Length of head 3.38, height of body 4.58, length of caudal 3.88 in the total; diameter of eye 2.62, and interorbital space 10.5 in the length of the head.

The head is compressed and obtuse. snout blunt, almost vertical in front, 2.7 in the eye, which is very large, and almost

(3) Günther, Ann. Mag. Nat. Hist. ii. 1878, p. 182, pl. xlix. fig. A.

*Since the foregoing was written Mr C. Tate Regan has proposed the name *Bathysauropsis* for a new genus of which *Chlorophthalmus gracilis* is the type species [Ann. Mag. Nat. Hist. (8) vii. 1911, p. 127.]

cuts the upper profile; preopercle nearly vertical, mouth slightly oblique, the jaws equal, the maxilla reaches to the angle of the preopercle: gills four, a slit behind the fourth, gill-rakers long and slender, twenty-three on the first arch, sixteen of which are on the lower limb; pseudobranchiae present.

Teeth.—In villiform bands in jaws, on palatines, pterygoids and vomer, also a double row on the tongue.

Fins.—The dorsal commences midway between the anterior margin of the eye and the adipose fin, the first two rays are short but the third and fourth, which are subequal are as high as the body; the length of the base is equal to the distance between the end of the snout and the hinder edge of the eye; the anal lies wholly behind the dorsal, and its margin is incised, the rays falling from the first to the tenth, whence they are subequal, the length of the first ray is equal to the base of the dorsal, and the last is inserted beyond the adipose fin; the pectoral is long, but little shorter than the dorsal, and it extends to the middle of that fin; the ventral equals the base of the dorsal, and its first ray lies somewhat in advance of that of the dorsal; caudal deeply cleft, its peduncle strongly compressed and twice as deep as its length behind the adipose fin.

Scales.—Cycloid, those of the lateral line slightly enlarged vertically. The upper mediolateral and the posterolateral photophores lie each in an auxiliary scale in the lower part of the seventeenth and twenty-sixth or twenty-seventh scales of the lateral line, respectively.

The photophores are placed as follows:—

Anteorbital.—The nostrils are situated in a small luminous area.

Opercular.—Two, close together, the lower one just behind the extremity of the premaxilla.

Pectoral.—Three, two of which lie close behind the opercular border, and are widely separated, the third is at the base of the lower pectoral rays.

Anterolateral.—Two, the first above the anterior ventral ray, the second slightly nearer to it than the lower mediolateral, all three in the same horizontal line.

Mediolateral.—Two, forming a straight line with the fourth ventral photophore.

Posterolateral.—One, on the lateral line, and over the last pore of the anterior series of the anal, behind middle of anal, but in advance of the soft dorsal.

Thoracic.—Four, the pore immediately in front of the ventral fin, and raised above the line of the thoracic pores, has been counted as an anterolateral.

Ventral.—Four, the first immediately behind the ventral fin.

Anal.—Fifteen, a break between the eighth and ninth; the anterior series is slightly convex above, the posterior one is straight.

Caudal.—Two, close together, the hinder one slightly raised in position.

Supercaudal (in all examples).—Small, occupying three scales.

Length.—81 mm., largest 92 mm.

The example obtained was ejected by a Dory, and was somewhat digested. The Dory was one of many taken in the Bay of Plenty, at a depth of 66-94 fathoms. Several specimens of *M. humboldti* were thrown aboard the trawler during the night of August 13th, when we rode out a storm off Cape Palliser.

I have associated the specimens obtained with *M. humboldti* with the published descriptions of which it well agrees. In suggesting the identity of *M. boops* with *M. humboldti*, Lütken⁴ added the Pacific to its habitat, but as I do not possess authenticated examples of either I am unable to write with more certainty than Lütken. My examples, however, agree much more nearly with the descriptions of *M. humboldti* than with that of Richardson, for in *M. boops* the pectoral is described and figured as reaching to the anus, whereas in my examples, as with *M. humboldti* it attains but to the middle of the dorsal. According to Richardson his specimen possessed both occipital and mandibular photophores, neither series occurring in the examples before me. The usual break in the anal series is not referred to and the dorsal fin is represented as very low; lower than the anal, and not half the height of the body, while the margin of the anal is illustrated as being straight. In these particulars the description does not apply to the specimens trawled. It has been suggested that *M. californiense* is identical with *M. humboldti*.

The only other species of the genus *Myctophum*, as restricted, recorded from New Zealand, is *M. hectoris* Günther⁵, but the shortness of the pectoral fin, scarcely reaching the ventral, coupled with the fact that the scales of the lateral line are rather smaller than the others, places that species out of consideration. A description of its photophores would be useful.

(4) Lütken, *Spolia Atlantica*, ii. 1892, p. 255.

(5) Günther, *Ann. Mag. Nat. Hist.* (4), xvii. 1876, p. 399.

SOLENICHTHYES.

Family MACRORHAMPHOSIDÆ.

CENTRISCOPS Gill, 1862.

CENTRISCOPS HUMEROSUS Richardson.

BELLOWS FISH.

Centriscus humerosus Richardson, Voy. Ereb. and Terr., 1846, p. 56, pl. xxxiv., figs. 5, 6.

Centriscops humerosus Gill, Proc. Acad. Nat. Sci. Phil., 1862, p. —.

Stations 18. 22, 29, 37, 51.

B. v.; D. vii. 15; A. 19; V. i. 5; P. 18; C. 9 + 12.

Length of head 2.0, height of body, at ventral fin 2.4, length of caudal 5.0 in the total; diameter of eye 5.5, length of snout 1.5, interorbital space 7.3 in the length of the head.

Head strongly compressed, a slight keel runs along the upper edge of the snout between the eyes and merges into the acute edge of the body; a strong horizontal ridge passes from the base of the snout on each side over the eyes, and backwards to the upper angle of the opercle, thence downwards towards the base of the pectoral, a similar ridge passes below the nostrils to the front edge of the eye thence forming its lower border; the snout is directed slightly upwards, and is roughened along its entire length; the nostrils are placed in a smooth area a little in advance of the eye and between the ridges above mentioned.

The body is excessively compressed and elevated, the anterior profile is very steep and there is a more or less prominent hump above the opercle, thence it runs straight to the first dorsal spine; the descent to the caudal peduncle is much steeper; the lower profile forms the even segment of a circle, drawn from a point on the dorsal edge, midway between the hinder edge of the eye and the first ray of the soft dorsal; forward of the anal fin the edge is acute and knife-like, and has five scutes in advance of the ventral fin, the hinder ones terminating in a spine. A ridge runs on each side of the median one and opposite to the ventral fin becomes spine-bearing; there are two median plates between the ventral and anal, each with a cluster of jagged spines.

Fins.—The first spine of the dorsal is very short and claw-like, the long second spine is equal to the length of the snout less the diameter of the eye, it is triangular in section and multi-grooved, each posterior angle being set with ten long

upwardly directed spines, confined to the basal two-thirds of the spine; the points of the five following spines form a vertical line and the last is immediately followed by the soft dorsal, the fourth and fifth rays are the longest, and one half more than the eye; the base of the anal is longer, and it commences much, and terminates slightly, in advance of the dorsal; the upper rays of the pectoral are longest, measuring twice the diameter of the eye; the ventral is very short two-thirds an eye diameter; the caudal is truncate, twice the length of the eye and the depth of its peduncle is half the length of the fin.

Scales.—Head and body covered with minute rough scales, and, in addition to the ventral keels already mentioned, there are the usual bony strips towards the upper part of the sides anteriorly.

Colours.—Base of snout and upper part of head and body orange, the other portions silvery; white lines, directed upwards and backwards lie in the neighbourhood of the upper bony strips and a thicker one runs a wavy course from behind the eye and joins the fifth line of the series referred to; a dark oblique broad band passes across the lower half of the body from under the pectoral rays to a space between the ventral and the anal, and is followed by a similar white band directed towards the anal rays; the fins are colourless.

Length.—153 mm.

The specimens obtained agree generally with Richardson's figure, but the snout is not so thick and is longer, the eye is much larger, and is nearer the profile, the back is straight and not saddled, the caudal is longer and the belly is less convex; the hinder profiles are not so steep, and the bony scutes have not the stellate form shown, the last difference may be due to the fact that the type was a dried specimen, and some of the other differences may be due to age.

Centriscops was taken on five occasions, somewhat remarkably only at southern stations, having been secured in the waters between Otago and Lyttelton Harbours, and at depths between 18 and 53 fathoms.

CENTRISCOPS HUMEROSUS, OBLIQUUS var. nov.

Plate XXVI.

There is an example in the Dominion Museum of which the Director, Mr. A. Hamilton, has kindly given

me a photograph: it is possibly an older specimen than the type, has a shorter spine, and is much more gibbous; with these exceptions and the larger eye and colouration, it more nearly agrees with the figure. It is marked with five oblique black bands on each side, the first passing between the eye and the pectoral, and the fifth running nearly parallel to the hinder profile and embracing the greater part of the caudal peduncle, the stellate form of the scutes can also be seen.

MACRORHAMPHOSUS Lacépède, 1803.

MACRORHAMPHOSUS SCOLOPAX Linnaeus.

SNIPE FISH.

Balistes scolopax Linnaeus, Syst. Nat. ed. x., 1758, p. 329.

Station 89.

B. iv.; D. v. 12; A. 19; V. i. 5; P. 15; C. 9 + 14.

Length of head 2.0, height of body 3.3, length of caudal 6.5 in the total: diameter of eye 5.1, length of snout 1.5, inter-orbital space 7.6 in the length of the head.

Head compressed, but wider than the body, the supero-lateral ridges of the snout divide in front of each eye, one branch passing over the orbit and continued as a bony strip along the body, the other branch goes to the eye at its mid height; the nostrils are situated in the triangle thus formed but the area is as rough as other parts.

The body is compressed and oblong, the upper profile forms three low angles, the first over the opercle, the next at the origin of the dorsal fin, and the third at the origin of the soft dorsal; the lower profile forms a low arc; there are five ridged scutes on the lower profile in advance of the ventral fin, two pairs bordering the groove of the fin and two scutes behind it, all except the thoracic ones are slightly produced as spines, a bony strip formed of three parts lies on each side the thoracic scutes.

Fins.—The dorsal arises midway between the front margin of the eye and the end of the caudal rays, the first spine is very short, the second is extremely long, equalling the height of the body, and nearly the length of the snout, it is acute in front and flat behind, the hinder edges bear upwardly directed thorns which,

however, leave the terminal two-fifths of the spine smooth, the third spine is less than the diameter of the eye, the two following ones are still shorter; the soft dorsal is separated from the spinous portion by a sub-horizontal space equal to its base, the fourth ray is the longest, one-sixth greater than the eye: the base of the anal is twice that of the dorsal, but both fins terminate in the same vertical: the ventral is small, and is inserted midway between the front of the eye and the end of the anal, it is receivable into a groove: the upper rays of the pectoral are twice the diameter of the eye: the caudal is emarginate, its length is one-half longer than the eye, and the peduncle is very narrow, its depth being but one-half the eye.

Scales.—Head and body covered with small elongated rough scales which are spinous, and extend over the greater part of the eye, the bony strip mentioned as passing over the eye extends to midway between the pectoral and dorsal and is obliquely crossed by three other strips, the two last of which join another sub-horizontal strip, which passes to the base of the first dorsal spine.

Colours.—Upper parts red, lower parts silvery, all the fins pink in life.

Length.—106 mm.

This species which was but once taken, constitutes an addition to the known fauna of the Dominion, though examples were taken by the Challenger Expedition between Sydney and Wellington. It was obtained in the Bay of Plenty: of the number netted, seventeen examples were secured, mainly by means of a hand-net as they escaped through the large meshes of the trawl, but scores were lost. The depth attained at Station 89 was 66-94 fathoms, the bottom being charted as sand, shell and mud.

The New Zealand examples agree very closely with the descriptions of the Mediterranean and Atlantic *M. scolopax*. Johnson⁶ recorded the species from Tasmania, but the New South Wales specimens differ considerably, and have been distinguished under the name *M. elevatus*.⁷

(6) Johnston, Proc. Roy. Soc. Tasm. 1884, p. 255.

(7) Waite, Mem. Aust. Mus. iv. 1899, p. 59, pl. vii. fig. 1.

Family SYNGNATHIDÆ.

SYNGNATHUS Linnaeus, 1758.

SYNGNATHUS NORÆ Waite.

LONG-SNOURED PIPEFISH.

Plate XXVII., fig. 1.

Syngnathus norae Waite, Proc. N.Z. Inst., 1910, p. 25.

Stations 2, 3, 4, 12, 22, 30, 50.

D. 39; P. 13; C. 8; Rings $18 + 49 = 67$.

Other specific characters and comparative details are shown on the accompanying table, the specimen examined being a female and marked "B".

The head is low, being but half the depth of the body, the opercle is not crossed by a ridge, the snout is long, more than twice the post-orbital length of the head, the dorsal begins on the anterior of the two rings occupied by the vent, and its base is not elevated, the anal is minute.

In the males the bodies are, as usual, not so high, nor is the dorsal edge ridged as in the females.

Colours.—Green with brown cross bands, five semi-bands on the body, namely, one behind the head, three in advance of the dorsal, and one across the vent; the three middle bands, each of which occupies three rings, separated by two rings, have above the lateral ridge of the body a brown vertical mark on each of the contributing rings; there are eight complete bands across the tail; a brown line from the eye to the snout on each side.

Length.—224 mm.

Examples obtained at Station 3 were removed from the stomach of *Callorhynchus*. *Polyprion* also yielded specimens.

This Pipefish appears to be a southern species, having been taken only between Stewart Island and Port Lyttelton, and at depths from 20 to 54 fathoms. It is, however, improbable that Pipefishes would have been secured at all by a trawl whose meshes measured several inches across, and I notice that the only stations at which they were obtained were those where I introduced either a small meshed net or a piece of sacking into the trawl. As with many other species, therefore, their distribution can be ascertained only when a properly-equipped expedition is provided for the scientific investigation of our marine resources.

I had provisionally associated the specimens with *S. pelagicus*, Linnaeus, examples identified as such, from New Zealand, being

in the British Museum. The markings on the body appear to be very similar but the number of dorsal rays and body rings is much greater in *S. norae*, the respective numbers being:—

S. pelagicus, Dorsal rays 29-32, Body rings $17 + 35 = 52$ maximum.

S. norae, Dorsal rays 37-40, Body rings $18 + 48 = 66$ minimum.

The nearest ally of the latter species appears to be *S. semistriatus* Kaup⁸, but the colour markings are different "Under the interrupted lateral line 19 cross stripes; above that line yellow spots with black borders." In *S. norae* the body bands are most pronounced on the upper half of the side. In Kaup's species the snout, when measured from the fore angle of the eye, equals in length the distance thence to the base of the pectoral fin. In the New Zealand species the same measure extends to the end of the pectoral rays, or to the end of the second body ring, which more nearly approximates Günther's⁹ redescription of Kaup's species under the name *S. semifasciatus*: the dorsal rays number 38 and the body rings $21 + 49 = 70$. He supplies the habitat as South Australia and Tasmania.

I have associated with this pretty species the name of Miss Nora Niven, after whom the trawler was named and from the owner of which I received many kindnesses while in Napier.

SYNGNATHUS BLAINVILLIANUS Eydoux and Gervais.

SHORT-SNOURED PIPEFISH.

Plate XXVII., fig 2.

Syngnathus blainvillianus Eydoux and Gervais, in Guérin, Mag. Zool. vii., 1837, pl. xvii.

Leptonotus blainvillii Kaup, Cat. Lophob., Brit. Mus., 1856, p. 46.

Station 2.

D. 38; P. 12; C. 6; Rings $18 + 42 = 60$.

The snout is short, being equal to the post-orbital length of the head; no ridge on the operculum; the dorsal begins on the second ring in advance of the vent, and its base is not elevated.

Additional details are given in the table on page 175, and the fuller account published in the report of the Sub-antarctic Expedition need not be repeated¹⁰.

The single specimen secured is a young female, obtained with examples of *S. norae* off Stewart Island, in 37-41 fathoms.

(8) Kaup, Cat. Lophobranchiate Fish, Brit. Mus. 1856, p. 48.

(9) Günther, Cat. Fish Brit. Mus., viii., 1870, p. 162.

(10) Waite, Vertebrata, Subantarctic Islands, N.Z., 1909, p. 588.

	A Male	B Female	C Male	D Female	E Male	F Female	* Female
Total length in millimetres ...	209	224	185	192	173	184	108
Head in total length ...	7.4	6.5	7.4	7.3	7.5	6.8	8.3
Head in head and trunk ...	2.6	2.6	2.8	2.7	1.9	3.0	3.2
Head and trunk in total ...	2.7	2.5	2.6	2.7	2.7	2.5	2.5
Head and trunk in tail ...	1.7	1.5	1.6	1.7	1.6	1.5	1.5
Height in head ...	2.8	6.8	3.5	2.6	3.8	3.4	2.6
Snout in head ...	1.7	1.6	1.6	1.6	1.7	1.6	2.1
Eye in head ...	7.0	8.5	8.3	8.6	7.6	9.0	6.5
Egg-pouch in tail ...	5.1	—	5.0	—	5.0	—	—
Body rings ...	18	18	20	19	19	20	18
Caudal rings ...	49	49	51	48	50	51	42
Dorsal begins on ring No. ...	17	17	17	17	16	17	14
Dorsal stands on (number of rings) ...	10	10	11	11	11	11	10
Pouch stands on (number of rings) ...	12	—	12	—	12	—	—
Dorsal rays ...	39	37	40	37	38	38	38
Pectoral rays ...	13	12	13	12	13	13	12
Caudal rays ...	8	8	7	8	8	8	6

*The first six columns refer to *S. norae*; the last one to *S. blainvillianus*.

HIPPOCAMPUS Rafinesque, 1810.

HIPPOCAMPUS ABDOMINALIS Lesson.

SEAHORSE.

Plate XXVIII.

Hippocampus abdominalis Lesson, in Ferussac, Bull. Sci. Nat. xi., 1827, p. 127, Bleeker, Verh. Akad. Wet. Amsterd. ii., 1854, p. 28, fig. 4. Kaup, Cat. Lophb. Brit. Mus., 1856, p. 17, pl. iii., fig. 3 (head).

Stations 25, 28, 30, 65.

D. 32; P. 18; Rings $11 + 49 = 60$.

Snout long, equal to the post-orbital portion of the head, the supraorbital ridges rise together abruptly at the base of the snout, and diverging form a simple spine over each eye, pointed outwards and backwards and terminating in a short filament; coronet low compressed, with a median filament in front and two behind placed on low knobs. Body very deep, the depth at the tenth ring being two and a third times the length of the snout; the spines are represented by low knobs slightly enlarged below the dorsal, a filament on the dorsal knob of the third body ring.

Colours.—Brown, with darker rings across the tail, snout, pouch, and under edge of tail yellow; dark brown markings at the base of the snout, below the eye, and opercle; circular spots on most of the body rings; dorsal fin spotted and with a narrow black intramarginal band.

Length.—238 mm., male.

In the females the body is much deeper, being three times the length of snout, and there are no filaments on head or body at any age. Young examples have the body spines much more pronounced, and in the males those of the first and third rings carry filaments.

The Seahorse was taken near the mainland only at three stations, namely, off Oamaru in depths of 18 to 35 fathoms. A very large female was obtained at Station 65 off Port Hutt, Chatham Islands, from 24-33 fathoms; it measures 312 mm. in length.

ANACANTHINI.

Family MACROURIDÆ.

- a. A fold of membrane limiting the aperture
of the first branchial arch; mouth
beneath the head *Coelorhynchus*.
- aa. First branchial arch free, mouth normal *Macruronus*.

CCELORHYNCHUS Giorna, 1803. *

Though the fact was not recognised on board the trawler, subsequent examination shows that two species of the genus were obtained. It is not therefore possible to supply the individual stations, excepting in certain cases as specified. The following is the complete list:—

Stations 5, 22, 26, 33, 34, 35, 36, 38, 39, 40, 41, 44, 45, 46, 47, 50, 51, 52, 53, 54, 57, 58, 59, 61, 63, 71, 76, 77, 81, 85, 88.

- a. Snout pointed, longer than the eye, scales
large, scales on the head well defined,
extremely spinous *australis*.
- aa. Snout obtuse, shorter than the eye, scales
smaller, less spiny, no distinct scales on
the head *aspercephalus*.

CÆLORHYNCHUS AUSTRALIS Richardson.

Plate XXIX., fig. 1.

Lepidoleprus australis Richardson, Proc. Zool. Soc., 1839, p. 100.*Macrurus australis* Günther, Cat. Fish. Brit. Mus. lv., 1862, p. 391, and Study of Fishes figs. 256, 257. Hector, Edible Fish. N.Z., 1872, pl. viii., fig. 78.

Stations (in part), 54, 59, 61, 71.

B. vi.; D. 12. 88; A. 89; V. 7; P. 16; L. lat. 96; L. tr. 5 + 18; Vert. 15 + 52 = 67.

Length of head 4.4, height of body 6.4 in the length: diameter of eye 3.4, length of snout 2.7 and interorbital width 4.2 in the head.

Snout long and very acute, whether viewed from above or in profile; longer than the eye; the latter is placed in the middle of the length of the head; the mouth lies below the space between the posterior nostril and (nearly) the hinder edge of the orbit, the gape is somewhat less than its length: the barbel is short, less than half the diameter of the eye: the nostrils lie near together close in front of the eye, the anterior one is an oval pore, the posterior one a long sub-vertical slit, rostro-infraorbital ridge nearly straight and strongly marked, the nasal ridge, which terminates between the eyes, is but slightly marked, the interorbital ridges, at first parallel, diverge, and joining the origin of the lateral line distinctly mark off the head scales from those of the body; the supraorbital ridges are continued to the upper angle of the opercle and a temporal ridge arising above the posterior angle of the eye is continued to and in the same direction with the lateral line.

The body is compressed throughout its length and tapers evenly to the end of the tail.

Fins.—The dorsal commences at a point one and a half diameters behind the orbit, its first spine is minute, the second is slightly shorter than the succeeding and longest ray, and is not serrated; the space between the two fins is equal to the diameter of the eye and to the length of the base of the first fin; the rays of the second fin are short and lie in a groove: the anal commences below the middle of the space between the two dorsals and is comparatively deep, its rays being equal to the eye; the pectoral extends to nearly below the origin of the second dorsal; the ventral arises beneath the hinder insertion of the pectoral and the outer lengthened ray reaches the base of the second anal ray.

Scales.—The scales on the head are fairly defined, but those on the sides of the snout and below the eye are more irregular with rough vertical spines; on the under side of the head the scales run together and form an even roughened area; the scales on the top of the head and on the temporal region though well defined have a scabrous appearance which marks them sharply from those of the body, the opercular scales are marked with smoother divergent striæ; each scale of the body bears about twelve slightly radiating ridges formed of imbricating spines and those of the lateral line are split down the middle.

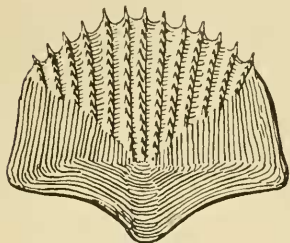


fig 1.

Scale of *Coelorhynchus australis*.

x 4.

Colours.—The general colour is a delicate grey, the body bears darker bands directed backwards, one in front of the first dorsal and another beneath the anterior rays of the second dorsal being best defined and persistent. A dark blue mark on the opercles is due to the presence of the black membrane beneath; the inner base of the pectoral is also black, the first dorsal and ventrals are grey, and a blue black line runs along the basal portions of the hinder half of the dorsal and anal fins, including the caudal.

Length.—416 mm. The largest specimen preserved measures 530 mm.

Hitherto this species has been considered as rare, but the trawling expeditions of 1900 and 1907 show that, on the contrary, it is quite common. It was probably taken along the greater part of the eastern seaboard, but, as above mentioned, it was not recognised as distinct from the next species, the list of stations being obtained from those preserved for future study.

Another species of *Coelorhynchus* was recorded from New Zealand seas by Günther under the name *C. parallelus*, but Jordan and Starks¹¹ consider that this may be distinct from the Japanese species, and propose to identify it as *C. kermadecus*.

CELORHYNCHUS ASPERCEPHALUS sp. nov.

Plate XXIX., fig. 2.

Stations (in part) 5, 22, 26, 35, 51, 58, 59, 63.

D. 12, 96; A. 87; V. 7; P. 16; L. lat. 136; L. tr. 8 + 20.

Length of head 5.2, height of body 6.8 in the length; diameter of eye 2.5, length of snout 3.5, and interorbital width 4.1 in the head.

(11) Jordan and Starks, Bull. U.S. Fish. Comm. xxii. 1904, p. 619.

Snout short and blunt, its margin obtuse from above, acute in profile, shorter than the eye, which latter equals the post orbital length: the front edge of the mouth lies beneath the posterior nostril, but the maxilla reaches to beneath the second third of the orbit: the gape is greater than its length; the barbel is short, less than half the diameter of the eye; the nostrils are as in *C. australis*, the rostro-infraorbital ridge is well marked and slightly sinuous, the nasal ridge is pronounced, terminating between the anterior borders of the orbits, the interorbital ridges are very faint, and are scarcely traceable beyond the hinder margin of the orbits.

Fins.—The dorsal commences at a point one and a third diameters behind the orbit, the first spine is short and the second is not quite so long as the second and third rays, which are longest and equal to the length of the head less the snout, the space between the two fins is small, equal to a third that of the base of the first fin; the rays of the second fin are very low, and the anterior ones lie in a groove: the anal arises below the narrow space between the two dorsals, and its middle and longest rays are slightly shorter than the eye: the pectoral extends to beneath the fourth ray of the second dorsal, the second ray of the ventral reaches the anal, but its first ray is a little longer, its hinder insertion is below the first dorsal spine.

Scales.—The head is everywhere roughened without distinct scales, the scales on the body are comparatively small, and those below the dorsal fin bear about 19 striae, each formed of minute imbricate spines, the scales of the lateral line are split along the middle.

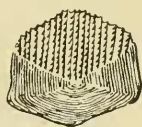


fig. 2.
Scale of *Coelorhynchus*
aspercephalus.
x 4.

Colours.—The general colour is greyish-yellow with many darker grey cross bands, which incline forward below; the edges of the opercles and branchiostegals and many of the scales bear minute black dots: the distal half of the first dorsal fin and all the ventral rays, the tip of the first excepted, are clouded, the tint in the ventrals being deepened by the presence of black dots: a black band runs along the whole length of the anal fin midway between the tips and bases of the rays.

Length.—264 mm.

This species may be distinguished from *C. australis* by its short, obtuse snout, the absence of definite scales on the head, the short intradorsal space, the smaller and smoother scales, the different direction of the dark bands crossing the body, and the character of the anal band: the scaleless head also

removes any suspected association with *C. fasciatus* Günther¹² the scales of the body also are much smaller with more numerous keels, and the distance between the dorsal fins is less. *C. fasciatus* was originally taken by the Challenger Expedition in from 40 to 245 fathoms off the east coast of the southern extremity of South America. It was next obtained in Cape Seas by Dr. Gilchrist, and Mr. McCulloch¹³ has recently identified it from 800 fathoms off the coast of New South Wales. He refers to the mutilation of the tail of the type specimen: this condition is quite common among the Macruroids, and in some of our specimens the snout also exhibits similar mutilations.

MACRURONUS Günther, 1873.

MACRURONUS NOVÆ-ZELANDIÆ Hector.

Plate XXX., fig. 1.

Coryphaenoides novae-zelandiae Hector, T.N.Z.I. iii., 1871, p. 136, pl. xviii., fig. 1.

Macruronus novae-zealandiae Günther, Rep. Voy. Chall. i., 1880, p. 22, and xxii., 1887, p. 157.

Stations 20, 76, 77, 78, 81, 86, 87.

B. vii.; D. 12, 96; A. 89; V. 8; P. 16; L. lat. 182; Se. tr. 8-16.

Length of head 5.6, height of body 7.5, in the length; diameter of eye 3.5, interorbital space 5.1, length of snout 3.4 in the head.

Head compressed, interorbital space flat, mouth large, lower jaw projecting, the maxilla reaches to below the middle of the eye; no barbel.

The body is strongly compressed, and tapers evenly to the end of the tail.

Teeth.—The teeth in the upper jaw are in two series, the inner one with small regular teeth, the outer teeth large and somewhat uneven, a single series of large teeth in the lower jaw, a band of small teeth on the vomer.

Fins.—The dorsal fin begins wholly behind the base of the pectoral, its first ray is the longest, one-half greater than the diameter of the eye: the ventral is placed slightly in advance of the point midway between the end of the snout and the

(12) Günther Chall. Rep. xxii. 1887, p. 129, pl. xxviii. fig. A.

(13) Mc. Culloch, Rec. Aust. Mus. vi. 1907, p. 348.

origin of the anal, and a little in advance of the vertical of the insertion of the dorsal, its length is half that of the head: the pectoral, which is rather longer than the ventral, extends to below the origin of the dorsal: the anterior rays of the anal form a lobe nearly as high as the first dorsal, but generally the rays are lower than those of the second dorsal fin.

Scales.—Sub-circular and cycloid, no trace of spines as mentioned by Hutton. The lateral line arises high, above the opercle, and dips to the mid line above the origin of the anal fin.

Length.—513 mm.

A specimen taken in the Bay of Plenty, shows that it attains to at least 935 mm.: this large specimen was secured by Mr. T. Anderton, after I left the trawler.

Colours.—General colour deep iridescent purple, the fins smoky; the lower part of the body silvery.

Examples of *Clupea neopilchardus* were taken from the stomachs of some of the specimens.

A single specimen was obtained north of Port Chalmers in 20-22 fathoms; the species was several times trawled between Castle Point and Gisborne, in the North Island. As suggested by Günther, it does not appear to live in the deeper water, none of our records being more than 28 fathoms, the minimum being 16 fathoms, while it is recorded to have been cast up in numbers in Cook Strait after heavy gales.

In their synopsis of the family *Macrouridae* Goode and Bean¹⁴ use as one of the distinguishing characters between *Macruronus* and *Steindachneria* the absence or presence respectively, of vomerine teeth. As above described vomerine teeth exist in the specimens of *Macruronus* examined by me: the forward position of the vertical fins, the anal especially, easily characterises *Steindachneria argentea*, at last specifically.

Günther draws attention to a mistake in the original illustration, writing:—"Some misunderstanding by the artist must have occurred, as, at any rate, the bifid barbel could not be at the place where he has drawn it." This figure was copied in outline in the "Cat. Fish. N.Z." ¹⁵ and an enlarged copy of the latter was published by Goode and Bean.¹⁶ The tail of the original specimen was evidently incomplete.

(14) Goode and Bean, *Oceanic Ichth.* 1895 p. 390.

(15) Hector, *Cat. Fish N.Z.*, 1872, pl. viii., fig 79.

(16) Goode and Bean, *Oceanic Ichth.* 1895, pl. ci, fig. 150.

Family GADIDÆ.

MERLUCCIUS Rafinesque, 1810.

MERLUCCIUS GAYI Guichenot.

HAKE, WHITING.

Plate XXX., fig. 2.

Merlus gayi Guichenot, in Gay, Hist. Nat. Chili, Zool. ii., 1847, p. 328, pl. viii., fig. 2.

Gadus australis Hutton, Cat. Fish, N.Z., 1872, p. 45, pl. vii., fig. 72.

Station 11.

D. 11, 36; A. 36; V. 7; P. 13; C. 24 + 10; L. lat., 169; Sc. tr. 20 + 38.

Length of head 3.3, height of body and length of caudal 5.0 in the total. Diameter of eye 7.4, length of snout 2.9, and inter-orbital space 3.6 in the length of the head.

Head very large and pike-like, the posterior border of the eye is exactly in the middle of its length: the interorbital space is lowly convex, with three parallel ridges; the nostrils are less widely separated than the orbits, the anterior one is very small, and is separated from the much larger posterior one by a thin septum; mouth very large, the maxilla reaching to the hinder border of the eye.

Teeth.—Large depressible teeth in two rows in the jaws, strong teeth also on the palatines, none on the vomer or the tongue.

Fins.—The first dorsal fin begins an eye-diameter in arrear of the opercular margin, and its third or longest ray is 2.5 in the head, the second fin is notched, but not very deeply, its median rays being one-half longer than the eye; the anal commences beneath the third ray of the second dorsal, and its notch is much deeper, being less than the diameter of the eye, and occurring posterior to the notch of the dorsal; the two fins end on nearly the same vertical: the pectoral is inserted beneath the angle of the opercle and extends to the vent; its length is 1.5 in the head: the ventral arises wholly in advance of the pectoral, and is nearly half the length of the head; the caudal is small, and its rays terminate evenly.

Scales.—The scales on the top of the snout and head and on the cheeks and opercles are very small, those of the body larger;

the lateral line is extremely pronounced and is gently bowed over the pectoral.

Colours.—General colour purplish-brown above, silvery beneath, inside of mouth and the caudal rays dark grey.

Length.—650 mm.

The only example taken during the whole cruise of the trawler, was obtained at Station 11, at the mouth of the Clutha River in 10 fathoms. Hector mentions that he obtained a specimen in Bruce Bay, on the West Coast, in 1866. Since that time, according to Hutton, it has been thrown up from Cook Strait.

Large specimens are very rarely seen in the Christchurch market, and though examples over three feet in length have been reported to me, the largest I have measured totalled two feet nine inches (840 mm.). Small specimens, twelve inches or so in length, are common, and are sold under the name of whiting.

In the official report of the trawling expedition, the above record is entered under "Hake (*Lotella rhacinus*)". In the report of the operations under the extended charter a similar entry occurs under Stations 125, 129 (in Karamea Bight, on the West Coast of the South Island), 155 (between Golden Bay and Tasman Bay, South Island), and 210 (near the Kaipara Entrance, West Coast, North Island), but whether these records, made by a different observer, refer to *Merluccius* or *Physiculus*, I am unable to say.

PHYSICULUS Kaup, 1858.

PHYSICULUS BACHUS Forster.

RED COD.

Plate XXXI., fig. 1.

Gadus bachus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 53.

Stations 6, 9, 10, 11, 12, 13, 15, 16, 17, 18, 20, 21, 22, 23, 27, 28, 29, 31, 32, 33, 34, 35, 36, 39, 40, 41, 42, 43, 44, 46, 50, 51, 52, 53, 57, 61, 63, 72, 75, 76, 77, 78, 80, 81, 83, 85, 86, 87, 95.

B. vii.; D. 10, 42; A. 40; V. 5; P. 23; C. 21 + 12. Vert. 16 + 28 = 44.

Length of head 3.7, height of body 4.3, length of caudal 4.7 in the length. Diameter of eye 4.6, interorbital space 3.0, and length of snout 3.6 in the head.

Head rounded, snout depressed, mouth sub-horizontal, the maxilla extending to beneath the hinder edge of the orbit, upper jaw slightly the longer, eye large near to the upper profile, inter-orbital space broad and flat; gills four, a slit behind the fourth, gill-rakers moderate fourteen on the first arch, eleven being on the lower limb. A barbel below the chin.

Teeth.—Villiform teeth in bands in the jaws, none on the tongue vomer or palatines.

Scales.—Head and body entirely covered with small scales; lateral line well marked; it forms a long arch to below the middle of the second dorsal fin, thence straight to the caudal.

Colours.—In life the general hue is grey with a reddish tinge, with iridescent bluish lines above and pinkish beneath: the dorsal fins are reddish-grey tipped with black, a blood-red mark towards the edge of the first fin: a large black blotch on the body behind the operculum, including the upper base of the pectoral, more extensive on its inner side; pectoral and anal red, without markings; caudal red edged with black. On removal from the water the grey colour speedily gives place to a uniform red, hence the vernacular name.

Length.—372 mm.

The stomachs of specimens examined yielded remains of crustaceans, also of the fishes *Argentina elongata* and *Caranx trachurus*. This species commonly harbours the crustacean *Chondracanthus lotellae* Thomson, of which it is the type host, and, as previously mentioned (p. 134) it is frequently attacked by the Blind Eel (*Eptatretus cirrhatu*s) exhibiting large wounds in its sides as a result.

The red cod was taken very generally throughout the cruise, but much more plentifully and uniformly so at the southern stations; the largest number of individuals netted at single Stations is as follows:—

Stations	9	10	11	15	20	21	27	36	39
Specimens	141	750	484	175	204	217	270	115	300

Two hundred examples were also taken at each of Stations 77 and 81, both south of Hawke Bay. The vertical range was from 9 to 102 fathoms.

This is one of the commonest of the New Zealand food fishes, but, unfortunately, it does not find much favour as a market species, and I am told that the trawlers return large quantities to the water, these, having been subjected to the pressure of the net, if not actually dead, never recover, even if, for the time being, they escape their natural enemies.

AUCHENOCEROS Günther, 1889.

AUCHENOCEROS PUNCTATUS Hutton.

Plate XXXI., fig. 2.

Calloptilum punctatum Hutton T.N.Z.I. v., 1873, p. 267, pl. xi., fig. 76.

Auchenoceros punctatus Günther, Rep. Chall. xxxi., 1889, p. 26, pl. iii., fig. c.

Stations 40, 41, 46, 86, 87.

B. vii.; D. 1 + 13 + 17 + 33; A. 68; P. 19; V. 2; C. 18 + 14; Vert. 10 + 37 = 47.

Length of head 5.1. height of body 4.7, length of caudal 5.6 in the length; diameter of eye 3.7, interorbital space 5.5. and length of snout 3.7 in the head.

Head and body strongly compressed, mouth oblique, jaws equal, gills four, a slit behind the fourth, pseudobranchiæ present, gill membranes free from the isthmus, which is narrow.

Teeth.—Villiform teeth in the jaws, none on vomer, palatines or tongue.

Fins.—First dorsal ray hairlike, placed over the root of the pectoral and a little shorter than the head; the second dorsal begins above the extreme tip of the pectoral or nearly twice the length of the head from the snout, the intermediate rays are very short to the seventeenth, whence they rise to form the third portion of the fin, the hinder part of which is elevated: the anal fin commences below the point midway between the first and second dorsal fins and terminates evenly with the dorsal, near to the caudal rays: the ventrals are equal to the head in length, the pectorals being somewhat shorter: the caudal peduncle is very slender, its depth being less than the diameter of the eye.

Scales.—Cheeks and opercles scaly, the scales are extremely deciduous, the number on the body, as indicated by the pits, being nineteen in the transverse, and ninety in the longitudinal series.

Colours.—Pink, a black spot within the upper angle of the opercle and a broad yellow band along the whole course of the lateral line.

Length.—157 mm.

As above indicated, two illustrations of the species have been published, the outline figure by Hutton does not show the intermediary dorsal rays, while the pectoral is represented as

emerging from beneath the gill cover, whereas it has a very pronounced fleshy base: the ventral is too short, and is represented as originating on the mid-line, while a non-existent ray is shown in front of the vent. Günther's figure is more nearly accurate, but the pectoral is represented as rather too high, and as overlapping the second dorsal. The middle rays of the dorsal are indicated as without membrane, and the elevation of the hinder portion of the fin is not shown, though included in Hutton's figure. When the mouth is closed the lower jaw does not project as stated. In his generic diagnosis he writes "Pseudobranchiæ none"; this is incorrect, for, though small, they are distinctly present.

This species was taken between Timaru and Lyttelton and again off Gisborne, at depths between $9\frac{1}{2}$ and 35 fathoms. Many specimens were obtained, the largest of which is described.

ALLOTRIOGNATHI.

Family LAMPRIDÆ.

LAMPRIS Retzius, 1799.

LAMPRIS PELAGICUS Gunnerus.

ОПАЖ.

Scomber pelagicus Gunnerus, Dronth. Selsk. Skr. iv., 1768, p. 80, pl. xii., fig. 1.

In the introduction (p. 53), I have given evidence that several examples of this fish were cast up on to the beach at Topenga Bay, on the northern coast of the Chatham Islands. I have there used the name *Lampris retzius*, but from a paper by Lönnberg¹⁷, which has just come to my hand, I find that this author claims priority for Gunnerus, writing as follows:—"Although *Lampris* is a benthopelagic fish which has its home in the warmer parts of the Atlantic, it is not unknown along the Scandinavian coasts, being, in fact, for the first time after the introduction of the binomenclature named *Scomber pelagicus* by the Norwegian bishop Gunnerus (1768)."

(17) Lönnberg, Annuaire Mus. St. Petersb. 1900, p. 242.

BERYCOMORPHI.

Family BERYCIDÆ.

PARATRACHICHTHYS Waite, 1899.

PARATRACHICHTHYS TRAILLI Hutton.

Trachichthys trilli Hutton, T.N.Z.I. viii. 1876, p. 212. Günther
Chall. Rep. xxii., 1887, p. 23, pl. lv., fig. A.

Paratrachichthys trilli Waite, Mem. Aust. Mus. iv., 1899, p. 65.

Station 77.

B. viii.; D. v. 13; A. iii. 10; V. i. 6; P. 13; C. 19 + 15.

Five examples of this species were taken at Station 77, this being the only occasion on which the fish was secured. The position was about five miles off the mouth of the Aohanga River, between Castle Point and Cape Turnagain, south of Hawke Bay. The depth was 20 to 23 fathoms and the bottom sand and mud. The largest specimen secured measures 212 mm. in length, and the life colours are very striking, the body being purple and all the fins red.

Reporting on the only specimen taken by the "Thetis" expedition, I mentioned that it differed from the description of the type by having thirteen in place of eleven abdominal scutes. Günther, who also found the scutes to number eleven, had three examples, but strangely only notes the anal peculiarity in one specimen, writing:—"The specimen from Otago shows a very extraordinary and probably abnormal position of the vent, which is placed between the ventral fins." The series to hand enables me to ascertain that the number of abdominal scutes is variable; of six specimens examined, including one taken off Wellington, I find the following characters:—One has ten scutes only, one has twelve and four have thirteen, also three specimens only possess the two anterior spines mentioned in my notice of the New South Wales specimen.

A second species of the genus (*P. prosthemi*) Jordan and Fowler¹⁸ has been described from Japan.

(18) Jordan and Fowler, Proc. U.S. Nat. Mus. xxvi. 1902, p. 9, fig. 1.

ZEOMORPHI.

Family ZEIDÆ.

The New Zealand representatives of the family may be thus distinguished:—

- | | |
|--|-------------------------------------|
| a. Bony plates at base of vertical fins.. | ZEINÆ.
<i>Zeus faber.</i> |
| aa. No bony plates at base of vertical fins | CYTTINÆ. |
| b. Body longer than deep. | |
| c. Two dorsal fins. | |
| d. Ventrals receivable into a sheath | <i>Cyttus.</i> |
| e. First dorsal filamentous .. | <i>australis.</i> |
| ee. First dorsal not filamentous | <i>novae-</i>
<i>zealandiae.</i> |
| dd. Ventrals not receivable into a
sheath | <i>Capromimus.</i> |
| ee. One dorsal fin | <i>Diretmus.</i> |
| bb. Body deeper than long.. .. . | <i>Rhombocyttus.</i> |

ZEUS Linnæus, 1758.

ZEUS FABER Linnæus.

JOHN DORY.

Zeus faber Linnæus, Syst. Nat. ed. x., 1758, p. 137.

Zeus australis Richardson, Voy. Ereb. and Terr., 1845, p. 36,
pl. xxv., fig. 1.

Stations 89, 90, 91, 92, 93, 94, 95, 96.

B. vii.; D. x. 24; A. iv. 22; V. i. 7; P. 14; C. 13 + 11; Se. 81;
L. lat. 114; L. tr. 15 + 108.

Length of head 2.45, height of body 1.78, length of caudal
4.0 in the total; diameter of eye 3.84, interorbital space 6.61 in
the head.

Body oval, strongly compressed, head deeper than long, the
profiles meeting at the snout form a right angle: the eye is
moderate, longer than deep, and placed high in the head, the
space below it being three times its vertical diameter; the snout
is nearly twice the length of the eye; the mouth is large and
oblique, and can be considerably protracted; the maxilla is twice
and the dentary twice and a half the diameter of the eye, the
latter is produced at the angle, and has a spine above it; the
lower jaw projects well beyond the upper.

The nostrils are placed immediately in front of and on a level with the axis of the eye, the anterior one is directed forward, the hinder one, which is much larger, being placed laterally; gill openings extremely large, gills four, no opening behind the last; gill-rakers short and stout, twelve on the first arch, eight of which are on the lower limb: pseudobranchiæ present: edge of preopercle long, oblique, and feebly curved.

Teeth.—A band of small teeth in each jaw and on the vomer, all directed backwards.

Fins.—The dorsal commences above the angle of the preopercle, which lies about one-third of the distance between the snout and the end of the caudal rays; the spines are long and slender and markedly heteracanth; in all but the last the membrane is filamentous; the first spine is a little shorter than the second, which is the longest and slightly less than twice the length of the head; the rays are shortest anteriorly, and the longest ones are equal to the diameter of the eye; the anal commences beneath the fifth or sixth dorsal spine, the rays of both fins being similar; the pectoral is short, the third or longest ray being one-fifth longer than the head: the ventral is inserted in advance of the pectoral; the spine is as long as the longest pectoral ray, and its second, or longest, ray is twice the length of the spine, and extends to beyond the vent: the caudal is truncate, and the depth of the peduncle equals its length.

Scales.—There are some deeply imbedded scales on the cheeks, otherwise the head is naked: the scales on the body are smooth and small, becoming a little larger towards the hinder vertical fins. There are eight bony plates at the base of the soft dorsal each bears a strong backwardly directed spine and also, the first excepted, a smaller one below the principal one; there are seven bony plates at the base of the soft anal, each bearing two spines, there are no plates at the base of the spinous portion of the fins, but the bases of the spines themselves have a laterally directed spine, the first of each fin respectively excepted; there are seven plates on the mid-line in advance of the ventral fins, each with a pair of spines, and eleven similar spinous plates between the ventral and the anal; the first two plates have each a single spine medially situated. The lateral line arises above the opercle, thence descends in an irregular curve to the mid-line of the body, whence it runs to the base of the caudal rays.

Colours.—Dark brown above, lighter beneath. A large ocellated spot in the middle of the side, an eye diameter behind the opercle, it consists of a light coloured ring, enclosing a black area which contains an irregular and varying light-coloured figure; the filamentous rays of the dorsal black; the distal

portions of the ventral and spinous anal dark brown, otherwise the fins are colourless.

Length.—364 mm.

The dory was trawled at the final eight consecutive Stations, all charted in the Bay of Plenty, and it was taken nowhere else during the first cruise: the depths ranged from 16 to 94 fathoms. In New Zealand it proves to be a northern species, and is not uncommon in the Auckland district. One hundred and sixty examples were taken at one haul in 30 fathoms in the Hauraki Gulf during the extended cruise of the trawler. I have no record of the Dory having been seen south of Cook Strait; the trawler "Doto" obtained examples in 1900, in Tasman Bay, which, though in the South Island, is northward of Wellington.

CYTTUS Günther. 1860.

CYTTUS NOVÆ-ZEALANDIÆ Arthur.

SILVER DORY.

Plate XXXII.

Zeus novae-zealandiae Arthur, T.N.Z.I. xvii., 1885, p. 163, pl. xiv. fig. 3.

Cyttus novae-zealandiae Gill, Mem. Nat. Acad. Sci. Phil. vi., 1893, p. 115.

Stations 22, 26, 67, 70, 83, 84, 85, 88, 89, 90, 91, 92, 93.

B. vii.; D. vii. 29; A. ii., 31; V. i. 6; P. 11; C. 13 + 4; L. lat. 76; L. tr. 10 + 52; Vert. 12 + 19 = 31.

Length of head 2.73, height of body 1.62, length of caudal 4.4 in the total; diameter of eye 2.77, interorbital space 3.81 in the head.

The head is deep; its upper and lower profiles are straight and meet in a slightly obtuse angle: the interorbital area is raised, due to the posterior process of the premaxilla whose tip lies in a V-shaped groove formed by the divergence of the supraoccipital above the middle of the eye: the eye is large, high in the head, the space below it being equal to twice its vertical diameter; the snout equals the length of the eye; the mouth is moderate and sub-vertical, it can be protruded to thrice the length of the snout: the nostrils lie close together in front of the eye, the anterior one is small, the other larger and vertically oval: the maxilla is one-fourth longer than the diameter of the eye, and is narrowed distally: the lower jaw

projects, the mandible is twice as long as the eye, and is produced at its lower angle; gill openings very large, gills three and a half, no opening behind the last: gill-rakers moderate, fifteen on the first arch, pseudobranchiæ small, edge of preopercle long and oblique, opercular bones thin.

Body short, deep, elevated and compressed, forming, with the head, a rhomboid; the anterior profile, from the snout to the dorsal spines straight, the posterior one, from the anal spines to the caudal peduncle nearly so; the upper posterior and the lower anterior profiles curved, especially the latter, the edge of which, though narrow is flat, and almost uniformly so.

Teeth.—The teeth are minute, in a single row in each jaw, a small patch on the vomer.

Fins.—The dorsal commences slightly in advance of a point midway between the end of the snout and the root of the caudal peduncle: the spines are short and slender, the first being minute, the second is the highest, being slightly longer than the eye: the others regularly decrease in height; they do not terminate in filaments: the rays are short anteriorly, and increase to behind the middle of the fin, where they are highest: the two anal spines are very short and curved, and are situated beneath the last dorsal spine; the soft rays are similar to those of the dorsal, but the base of the fin extends a little further posteriorly: the pectoral is short, its third or longest ray being one-seventh longer than the eye, its margin is rounded and its base narrow: the ventrals are inserted behind the pectorals, and can be received into a deep groove which extends from their base to that of the first anal spine: the ventral spine is straight and weak, its length slightly more than the diameter of the eye, its rays are longer: caudal slightly emarginate, its peduncle narrow, and half the length of the fin.

Scales.—All the scales are cycloid, those above being slightly roughened, they are strongly adherent, and the exposed portion is four times as deep as broad, the scales on the head are confined to the cheeks, which are deep and triangular; the bases of the vertical fins are sheathed in two rows of enlarged scales, but there are no bony plates. The lateral line arises abruptly above the opercle thence curves backwards, but does not run quite concurrently with the back, its hinder half being slightly concave above.

Colours.—Silvery, upper portion from eye to caudal brown, membrane of dorsal spines, distal half of ventral rays and end of caudal black: all other fins colourless.

Length.—202 mm.

Evidently an inhabitant of moderately deep water, this species was taken between the extremes of 30 or 40 and 94 fathoms, and probably occurs at greater depths. It was taken on two occasions off the South Island, namely, between Otago Harbour and Oamaru. It is to be remarked that it was not again encountered until Hawke Bay, in the North Island, was reached, when it was taken at both hauls made in the Bay. It was again taken at the deepest of the three Stations charted south of Gisborne, and at nearly every essay in the Bay of Plenty. It was also secured at the Chatham Islands, being taken at both sides of the island.

The known distribution of this species is now considerably extended, the original examples having been taken off Otago, and I have not met with reference to the fish since it was first recorded.

It is somewhat surprising that *Cyttus australis* Richardson,¹⁹ was not once netted, both Hutton and Hector²⁰ mention it as having occurred on the shore of Cook Strait after heavy gales, in November, 1871.

CAPROMIMUS Gill, 1893.

CAPROMIMUS ABREVIATUS Hector.

Plate XXXIII.

Platystethus abbreviatus Hector, T.N.Z.I. vii., 1875, p. 247, pl. xi., fig. 31c.

Cyttus abbreviatus Hector, *loc. cit.* ix., 1877, p. 465. Günther, Chall. Rep. xxii., 1887, p. 42, pl. x., fig. B.

Antigonia mulleri Klunzinger, Sitz. Akad. Wiss. Wien, lxxx., 1880, p. 380, pl. v., fig. 3.

Capromimus abbreviatus Gill, Mem. Nat. Sci. Phil. vi., 1893, p. 115.

Stations 83, 84. 88.

B. vii.; D. vii. 27; A. ii. 28; V. i. 6; P. 16; C. 11 + 4 + iv. Sc. 63; L. lat. 69; L. tr. 7 + 22; Vert. 11 + 20 = 31.

Length of head 2.48, height of body 1.63, length of caudal 3.94 in the total: diameter of eye 2.25, interorbital space 2.7 in the head.

The head is deeper than long, the profiles meeting at the snout form a right angle. Eye very large and round, the space below it equal to its diameter, the snout is one-third shorter

(19) Richardson, Voy. Ereb. and Terr. 1848, p. 136.

(20) Fishes of N.Z., 1872, pp. 19, 112.

than the eye; the mouth is moderate and oblique, it can be protracted to twice the length of the snout; the maxilla is one-fifth longer than the eye; the jaws are equal; the mandible is one-half longer than the eye, and is produced into a spine below; the posterior nostril is a vertical slit close to the front edge of the orbit; the anterior nostril is in a tube directed forwards: gill openings moderately large, gills three and a half, a slit behind the last; gill-rakers small, fifteen on the first arch; pseudo-branchiæ present; edge of preopercle short and rounded.

Body short, deep, elevated and compressed, forming, with the head, almost a rhombus, the upper posterior and lower anterior edges being the further apart; anterior profile straight, except where broken by the tumidity in front of the eyes: lower hinder profile from the anal spine upwards, nearly straight; lower edge of body broad and flat.

Teeth.—The teeth are minute and form a narrow band in each jaw: there is also a small patch on the vomer.

Fins.—The dorsal fin commences a little behind a point midway between the end of the snout and the root of the caudal peduncle; the spines are stout, the second, and longest, especially so; its length is one-fourth greater than the diameter of the eye, and when depressed reaches to the base of the sixth ray; with the exception of the first, which is short and equal to the seventh, or one-third the diameter of the eye, the spines are graduated backwards, they are free for about one-third their length, but in the second the membrane extends but half way up: the rays are short anteriorly, and are graduated to about the eighteenth whence they become shorter, the longest is a little less than the diameter of the eye; they are simple as are also those of the anal and pectoral: the first anal spine is stout and dagger-like, and is one-half the diameter of the eye; the second is short and weak; the rays are similar to those of the dorsal but extend a little further back: the vertical fins lie in a broad and deep groove bounded by the spiny scales of the sheath: the pectorals are short and rounded, the seventh, or longest ray being three-fourths the diameter of the eye; the ventrals are widely separated and have a lateral aspect, they cannot be received into a groove, the spine is strong, one-sixth longer than the eye, and extends to the first anal ray; the rays are slightly longer; the caudal is truncate, and has two sharp spines at the base of the rays, above and below; the peduncle is slender, twice as long as deep.

Scales.—The scales are cycloid but rough, producing a harsh sensation to the touch; they are strongly adherent and the exposed portion is four times as deep as wide, the head is naked

with the exception of the cheeks; the scales which form the sheaths of the vertical fins are enlarged, and bear each about six spines, of which the first is the largest. There are twenty-six spinous scales at the base of the dorsal, the first commencing with the fourth spine, and seventeen at the base of the anal. The lateral line rises from the upper angle of the opercle, thence follows the line of the back.

Colours.—The general colour is silvery, and the body is strikingly marked as follows:—A broad purplish band arises behind the eye, follows near to the curve of the back, and deepening to black passes in advance of the caudal peduncle, thence half way towards the ventral; this band is sometimes broken at its hindermost point. A black crescent, widening below, passes from above the base of the pectoral, behind the fin, to a position in advance of the ventral; there is also a black spot above the insertion of the last ventral ray and a brown band at the base of the caudal; all the fins are colourless.

Length.—84 mm.

This pretty little fish was first made known from a specimen obtained by the Challenger Expedition in 400 fathoms off Cape Farewell. It is surprising that we secured it at all, seeing that the greatest depth reached was, with a single unanticipated exception, 105 fathoms; it was however taken at this depth, recorded in the Bay of Plenty: it was likewise secured at both hauls made in Hawke Bay, the depth ranging from 68 to 82 fathoms.

Under the name *Antigonia mulleri*, Klunzinger describes the species from New Zealand, but without indication of locality or depth.

HETEROSOMATA.

Family PLEURONECTIDÆ.

In his official report on the Expedition Mr. L. F. Ayson writes:—

“One of the reasons why the cruise was undertaken in the winter season was for the purpose of ascertaining the winter habitat of the flat-fish, as they generally disappear from the in-shore trawling-grounds during that season. The general opinion of fishermen is that they either go out to deep water or migrate to off-shore banks which were supposed to exist. The result of the work done during this cruise would seem to negative both theories, as no flat-fish of any value were obtained beyond the

depths at which they were taken at other seasons, and no off-shore banks were found to exist within the 100-fathom line, and beyond that all the soundings taken showed a sudden drop down to great depths. It is probable that the disappearance of flounders and soles off the known fishing grounds at certain seasons is due to weather and temperature conditions and spawning habits, and, like the soles and plaice in the Northern Hemisphere, they partly bury themselves in the sand on the bottom. In this way the trawl net would pass over them."

This quotation will indicate that in New Zealand, as elsewhere, the flatfishes are accounted as of considerable commercial importance, and the writer of the paragraph has asked me to pay special attention to the group with the object of ascertaining what species are really referred to under the common names applied by fishermen, dealers and the public generally. Mr. Thomas Anderton, Director of the Portobello marine fish hatchery, has also made a similar suggestion, remarking that as the Government is importing European flounders it will be well to have a reliable guide to native species, so as to prevent confusion in the future.

It has not been found possible to do this as thoroughly as could be wished, for there are several species recorded from our waters which were not taken by the trawler. This deficiency has, to a certain extent, been minimised by both the gentlemen named, they having forwarded specimens to me from districts accessible to them. I have also to thank the President and Council of the Canterbury Acclimatisation Society for granting me facilities for acquiring specimens and also the rangers of the Society, Messrs. David Hope and William Cobeldick for procuring specimens from Lake Ellesmere in the Canterbury Province.

My efforts have been mainly directed towards ascertaining the number of species, their correct designation and the relationship they bear to one another, also in endeavouring to discover characters whereby the different kinds may be easily identified. It will however be evident that this is only a small portion of the investigation which should be carried on, and my experience leads me to think that no better work in the domain of fisheries could be undertaken by the Government than a proper investigation of the flatfishes of the waters of the Dominion.

Several trawlers regularly operate for the supply of fish to each of our principal centres, and I venture to think that the masters of the craft could obtain much valuable information with very little trouble. The distribution of good coloured illustrations supplemented with a little personal coaching would enable the men to correctly identify the different species taken. If any specimen was found which could not be thus identified, it

should be tagged and at once forwarded to head quarters for examination. I would further suggest that a schedule be drawn up and copies placed in the hands of all the masters of trawlers with the request that it be filled up as regularly and carefully as the ship's log. It is not to be expected that all the trawling masters would comply with the request, but some useful information would certainly result. Among the more important subjects of inquiry we should endeavour to learn:—(1) The different kinds of flatfishes inhabiting the several localities, and the extent of the grounds peopled by each kind; (2) their relative abundance at different seasons; (3) their migrations and the reason for such, whether for breeding, or questions of food, temperature, etc.; (4) the nature of the food; (5) the spawning season; and (6) the development of the ova. The last named could be supplemented by observations made in the laboratory, and as we already possess such an institution in the Marine Biological Station, at Portobello, there is no reason why a very complete set of observations should not be made. These schedules would be regularly sent to those entrusted with the work, and the information being collated, our knowledge would in time be greatly extended. We should then be in a position to determine how best to improve our source of fish food, whether by working certain grounds at the best season or by artificial propagation, and by rearing and planting the young fry in localities known to be suitable for their further development.

A reading of the local literature relating to the flatfishes, together with information supplied by Christchurch fish dealers and others, indicates that the following names are in use for our commercial species. Black Flounder, Brill, Flounder, Grass Flounder, Greenback, Lemon Sole, Mahoa, Megrim, Patiki, Sand Flounder, Sole, Three corner, Tinsplate, Turbot, Witch, and Yellow-belly.

As, however, it is improbable that this list is exhaustive, I shall be pleased to receive communications on the subject, but must ask any correspondent to forward the specimen to which he refers, as otherwise no absolute decision can be given.

The trivial nomenclature is very involved; a certain species may be known by several common names, and, on the other hand, a given name may be applied to two or more species, thus Flounder, Sand Flounder, Three corner and Tinsplate are names all applied to *Rhombosolea plebeia*. The name Brill has been used to designate *Caulopsetta scapha* and *Ammotretis guntheri*. Some of the names are only found in books and seem never to have been current among the fishing community or the public. It is probable that the names in use vary in different districts, as in Britain, an undesirable condition, but one somewhat difficult to remedy. No law except that of usage can operate in respect

to common names, and all one can do is to adopt that most in common use, and attempt to fix it by means of publications, the more popular the better, and supplemented by effective, good coloured illustrations. If such were displayed on the trawlers and at the fish markets the attendant names would soon be in use, and I venture to think that uniformity of nomenclature would be in time secured.

Though the common names suggested appear in the following account under their respective scientific headings, it will be advisable to give some indication of their synonymy as follows:—

Suggested name.	Other names.	Scientific name.
Black Flounder	- Patiki -	<i>Rhombosolea retiaria</i>
Brill - - -	- Turbot -	<i>Ammotretis guntheri</i>
Greenback Flounder -	Grass Flounder -	<i>Rhombosolea tapirina</i>
Lemon Sole -	<i>Ammotretis rostratus</i>	<i>Pelotretis flavilatus</i>
Megrim - - -	Brill, Mahoa, Witch	<i>Caulopsetta scapha</i>
Sand Flounder	{ New Zealand Flounder, Patiki, Three corner, Tinplate }	<i>Rhombosolea plebeia</i>
Sole - - -	- English Sole -	<i>Peltorhamphus</i> <i>novae zeelandiae</i>
Turbot - - -	<i>Ammotretis rostratus</i>	<i>Ammotretis nudipinnis</i>
Yellow-belly	{ <i>Rhombosolea flesoides</i> } { <i>Rhombosolea leporina</i> }	<i>Rhombosolea millari</i>

It is to be understood that in no case have I transferred any name from one species to another. To give an example: the name Brill appears to have been first used by Dr. Hector,²¹ who writes: "It has been termed Brill on account of its being the only one of our flatfish with the eyes on the left side of the head (*Pseudorhombus scaphus*); it is of small size and is so full of bones that it cannot be eaten with any comfort."

The fish indicated by this book name is commonly called Megrim or Witch, while the name Brill is freely used in connection with *Ammotretis guntheri*, it is therefore here associated with this large and prime edible species.

It might be argued that because the British Brill is a left-sided fish it is wrong to apply the name to a right-sided species in New Zealand; one cannot force names upon the public, but if two or more names are in use for the same species we are justified in attempting to secure uniformity of nomenclature within the Dominion. "Turbot" is the only name I have so far met with applied to *Ammotretis nudipinnis*, and this fish also

(21) Hector, Edible Fish N.Z., 1872, p. 117.

is a right-sided species, whereas the British Turbot is left-sided, both are however good to eat, and "New Zealand Turbot" is by no means a bad name.

Owing, perhaps to the looseness with which these common names have been used, a considerable amount of misconception has arisen in respect to the scientific names also, thus the Lemon Sole has been generally identified with *Ammotretis rostratus*, a species which I have reason to believe is not found in New Zealand seas, but represented by an allied though undescribed species, *Ammotretis nudipinnis*. In any case the common Lemon Sole does not belong to the genus *Ammotretis* as previously supposed, a supposition which, probably taken as an axiom, left no ground for further research. As far as I am aware, therefore, this fish has never been described, and it will here be found under the name *Pelotretis flavilatus*.

This confusion of names may be very embarrassing to those who may not be specialists in taxonomy, but nevertheless undertake excellent work in connection with the life history, distribution, artificial propagation, diseases, and other subjects connected with our fisheries. It is difficult to give examples without appearing to be somewhat personal, but I trust that my remarks may be taken in the spirit in which they are intended.

Mr. Thomas Anderton, to whom I have before referred, and to whom I owe many courtesies, has written a very excellent account of the development of some of our marine fishes, but as the following quotation will indicate, he makes no pretence of dealing with the troublesome question of nomenclature, and indeed on this very account delayed the publication of his work for a whole year:—"Owing to the uncertainty as to the identity of the two species of Flounders which were taken in the harbour it was considered inadvisable in last year's report to publish an account of the eggs and larvæ until the species had been definitely ascertained. This has now been done by Professor Benham, and we are able to give a few particulars of each species."²²

The species referred to are *Rhombosolea plebeia* and *R. tapirina*, which, if it be not presumption for me to say so. I have had the opportunity of verifying. On the previous page Mr. Anderton refers to "The Brill" remarking—"This fine fish appears to be only an occasional visitor; it is seldom taken on trawling grounds off Otago Heads, and only in small quantities. It is a very handsome fish, and is greatly esteemed as a table delicacy. Nothing is at present known of its habits and movements, but it is a fish deserving every possible attention." Mr. Anderton has used the name *Pseudorhombus scaphus*

(22) Anderton, Trans. N.Z. Inst. xxxix. 1907, p. 480.

in connection with this fish, but it will be evident that this "fine handsome fish, deserving every possible attention" can not be the one to which Dr. Hector applied the same name under the remark, "it cannot be eaten with any comfort." When, however, the name Brill is applied to *Ammotretis guntheri* Mr. Anderton's statement becomes perfectly intelligible and apt. Instances of this character might be multiplied, but enough has been written to indicate that my statements as to the unsatisfactory condition of the nomenclature of the New Zealand Flatfishes are by no means uncalled for.

Thirteen species of flatfishes, assigned to seven genera, are now known to inhabit New Zealand coasts and rivers, one of which is believed to be confined to fresh or brackish water.

The full list is as follows:—

- **Caulopsetta scapha* Forster.
- Caulopsetta boops* Hector.
- Caulopsetta hectoris* Günther.
- Apsetta thompsoni* Kyle.
- Brachypleura novae-zeelandiae* Günther.
- **Pelotretis flavilatus* Waite.
- **Ammotretis nudipinnis* Waite.
- **Ammotretis guntheri* Hutton.
- **Peltorhamphus novae-zeelandiae* Günther.
- **Rhombosolea plebeia* Richardson.
- Rhombosolea tapirina* Günther.
- **Rhombosolea millari* Waite.
- Rhombosolea retiaria* Hutton.

Of these, only seven were taken in the trawl, they are indicated by an *. For reasons already given, my study has not been confined to these seven species, but has embraced all those, which as far as I am aware, find a place in our markets. Two species of *Caulopsetta*, and the monotypic *Brachypleura* and *Apsetta* have not been recognised since first described, and not having specimens to hand, these do not appear in the report. As, however, a statement of their distinguishing features may be useful their characters are included in the following synopsis of genera:—

- a. Eyes on the left side, two ventral fins
 - b. ventrals separate from the anal, scales
 - ctenoid *Caulopsetta*.
 - bb. Left ventral connected with the anal, scales cycloid *Apsetta*.

- aa. Eyes on the right side.
- c. Two ventral fins, scales wholly imbricate.
- d. Ventrals separate from anal, scales cycloid *Brachypleura*.
- dd. Right ventral connected with the anal, scales etenoid.
- e. Snout normal, dorsal fin commencing over the eye . . . *Pelotretis*.
- ee. Snout produced over the mouth, dorsal fin commencing at its tip.
- f. Mouth visible from right side, pectoral short and rounded *Ammotretis*.
- ff. Mouth concealed from right side by cutaneous extension of rostral process, pectoral long, upper ray produced . . . *Peltorhamphus*.
- cc. Ventral fin single, connected with the anal, scales imbedded non-imbricate, at least anteriorly *Rhombosolea*.

Flatfishes are occasionally subject to reversal, that is, a right-sided Megrin or a left-sided Flounder may be found, but such are so very infrequent that the condition is worth recording when it does occur.

The dimensions recorded under each species are those of the specimens described and figured, and are taken from the end of the snout to the tip of the middle caudal rays. They are not necessarily those of the largest specimens seen. The colouration is described from preserved examples and is little guide to the fishes in life.

CAULOPSETTA Gill, 1893.

CAULOPSETTA SCAPHA Forster.

MEGRIM.

Plate XXXIV.

Pleuronectes scapha Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 163.

Platessa? scapha Rich. in Dieffenbach, N.Z. ii., 1843, p. 222.

Pseudorhombus scaphus Hutton, Cat. Fish. N.Z., 1872, p. 51, pl. ix., fig. 82.

Caulopsetta scaphus Gill. Mem. Nat. Acad. Sci. vi., 1893, pp. 121, 124.

Stations 1, 2, 3, 5, 6, 16, 17, 18, 19, 20, 21, 22, 23, 25, 26, 27, 28, 29, 31, 32, 35, 36, 39, 40, 43, 46, 47, 48, 49, 50, 51, 54, 61, 63, 64, 65, 66, 67, 69, 70, 71, 74, 81, 86, 87, 89, 90, 91, 92.

B. vii.; D. 117; A. 95; V. sin. 6, dex. 6; P. sin. 14, dex. 10; C. 14 + 4; L. lat. 85*; Vert. 12 + 35 = 47.

Length of head 4.1, height of body 2.2, length of caudal 5.5 in the length: eyes on the left side, lower eye one-fourth its length in advance of the upper, and 5.5 in the length of the head, snout longer than the eye: interorbital space a very narrow raised ridge, one-fourth the depth of the eye: nostrils in a depression in advance of the interorbital ridge: mouth nearly symmetrical with teeth on both sides, though less extensive on the left, the maxilla is 2.5 in the length of the head.

Fins.—The dorsal fin commences over the anterior nostril, the longest rays being one-fifth the height of the body, it extends to the base of the upper caudal ray: both ventrals distinct and free from the anal, the latter similar to the dorsal: the length of the left pectoral is 1.8 in that of the head, the right being smaller and shorter: caudal rounded, the peduncle about half the length of the fin.

Scales.—Ctenoid, imbricate, absent from the jaws and fore part of the head, but extending on to all the fin rays, the pectoral excepted. The lateral line forms a bold arch over the pectoral, the top of the arch being quite flat, the line thence passes evenly along the middle of the body: the scales of the lower side are nearly smooth and extend on to the fin rays of the caudal only; the lateral line is well developed and has a similar contour to that of the upper side.

Colours.—The upper surface, including the fins, is uniform greyish yellow, with minute irregularly disposed black spots; lower surface uniform yellow.

Length.—325 mm.

The commonest and most widely distributed of the flatfishes of New Zealand, and yet, unfortunately, the least valuable. It was taken from one end of the course to the other, and at all depths tested: it is a very thin species, and the long fine bones render it unsuited for table use. In the official reports it is entered as "*Megrin Ammotretis* sp. ind.," and in his report on the 1900 expedition Mr. Ayson wrote:—"This fish was found

*The scales are counted from the margin of the opercle.

at any depth, but generally present in the deepest water tested, and then frequently found in considerable numbers when no other flatfish were taken. The largest specimen taken measured $12\frac{1}{2}$ inches. These fish are peculiarly transparent, flesh white and full of fine bones."

Two other species of the genus have been described, namely:—*C. boops* Hector and *C. hectoris* Günther, but they were not taken by the trawler. They were included in the collections of the Challenger Expedition, made in deep water, beyond the reach of payable trawling; moreover they are doubtless equally inedible with the Megrim.

RHOMBOSOLEA Günther, 1862.

Stations 7, 8, 10, 16, 32, 35, 40, 44, 45, 46, 51, 52, 61, 72, 76, 77, 96.

Owing to the unsatisfactory condition of our knowledge of the members of this genus it was not possible to identify the species as they were brought aboard, but an examination of the specimens preserved indicates that but two species were taken, namely, *R. plebeia* and *R. millari*. The specific stations at which each was secured cannot however be given.

A study of the literature and available specimens indicates that there are four species of *Rhombosolea* at present described from our waters, one of which, *R. millari*, is herein named for the first time. The following synopsis indicates their distinguishing characters:—

- | | | |
|--|---------|-------------------|
| a. Body deep, 1.4 or more in the length, vertical fins elevated, shape rhomboidal, colour grey clouded | | <i>plebeia</i> . |
| aa. Body lower, 1.7 or less in the length, shape ovate. | | |
| b. Anterior profiles straight, or nearly so, eyes large. | | |
| c. Snout produced over the mouth, ventral inserted below the eye, colour green above, with dark blotches, pure white below | | <i>tapirina</i> . |
| cc. Snout normal, ventral inserted behind the eye, colour grey, clouded; yellow below, uniform or with scattered black spots | | <i>millari</i> . |
| bb. Anterior profiles rounded, eyes small, colour olive with red spots, dark beneath | | <i>retiaria</i> . |

RHOMBOSOLEA PLEBEIA Richardson.

SAND FLOUNDER.

Plate XXXV.

Rhombus plebeius Rich. in Dieffenbach, ii., 1843, p. 222.

Rhombosolea monopus Günth., Cat. Fish. Brit. Mus. iv., 1862, p. 459. Hutton, Cat. Fish. N.Z., 1872, p. 51, and (Hect.) p. 117, pl. ix., fig. 83. MacL. P.L.S. N.S. Wales, vi., 1881, p. 129.

Bowenia novae-zealandiae Haast, T.N.Z.I. v., 1873, p. 277, pl. xvi.

Rhombosolea plebeia Gill, Mem. Acad. Sci. Phil. vi., 1893, p. 121.

B. vii.; D. 60; A. 43; V. 6; P. 11; C. 14 + 4; L. lat. 159; L. tr. 36 + 54; Vert. 10 + 18 = 28.

Length of head 3.3, height of body 1.3 in the length. Lower eye one-third in advance of the upper, diameter (orbital) 4.9 in the head; interorbital space smooth, less than the depth of the eye: snout a little shorter than the eye, anterior nostril of both sides with a skinny process behind, posterior nostrils simple.

Teeth.—In several rows in the jaws of the blind side only.

Fins.—The dorsal commences on the snout, but not quite at its tip, though in advance of the nostrils; the first ray is almost free, the following ones successively less so; the 28-31 rays are the longest, being 2.2 in the head: the distance of the insertion of the last ray from the base of the outer caudal ray is one-half the depth of the peduncle: ventral and anal continuous, the division corresponding to the absence of one or two rays, the vent occupying the position; the longest rays of the anal are at least equal to the dorsals and occur at the 12-15th: the pectoral of the coloured side is slightly the longer, being 1.8 in the head; it has a wider base, but is placed exactly opposite to its fellow: caudal large, its margin rounded, the peduncle one-half the length of the fin.

Scales.—Fore part of snout, interorbital space and mandible naked: scales cycloid, deeply imbedded and non-imbricate anteriorly, producing a honey-combed appearance. Lateral line feebly wavy above the pectoral, otherwise straight to the extremity of the tail, a branch is continued forward to the upper part of the head.

Colours.—Upper surface grey with clouded markings, fins dusky at the margins, lower surfaces colourless.

Length.—386 mm.

This is the commonest and best-known of the New Zealand flounders, occurring all round the coasts, in addition to being obtained in shallow water it was taken at a depth of 60 fathoms. It was not included in the catches made at the Chatham Islands.

Though commonly called Sand Flounder or Flounder simply, such names as Tinplate and Threecorner, applied by fishermen, indicate how the characteristic shape of the species is utilised as a ready means of identification.

RHOMBOSOLEA TAPIRINA Günther.

GREENBACK FLOUNDER.

Plate XXXVI.

Rhombosolea tapirina Günther, Cat. Fish. Brit. Mus. iv., 1862, p. 459. Hutton T.N.Z.I. vi., 1874, p. 106 (not *ib.* v., 1873, p. 268).

B. vi.; D. 67; A. 50; V. 6; P. dex. 12, sin. 11; C. 14 + 4; L. lat. 91; L. tr. 25 + 34.

Length of head 3.4, height of body 1.7, length of caudal 4.8 in the length. Lower eye very slightly in advance of the upper, 4.5 in the head, interorbital space very narrow, not half the vertical diameter of the eye; snout one-half longer than the eye produced into a fleshy process which overhangs the mouth: mouth small, only slightly more developed on the blind side. The anterior profiles of head and body are nearly straight, but the lower one is broken by the head, which depends below the profile.

Teeth.—Confined to the blind side; they are small and in several rows.

Fins.—The dorsal fin commences at the base of the rostral process, that is, nearly an eye diameter from the tip, and its three anterior rays are slightly split, the remainder being simple; the longest ones are 2.4 in the head: the ventral commences below the posterior third of the lower eye, and is continuous with the anal, which terminates evenly with the dorsal; the left pectoral is inserted exactly opposite to the right one but is a little shorter: the caudal is rounded and the depth of the peduncle is 1.9 in the length of the fin.

Colours.—Body and fins green above with black blotches, the anterior dorsal and anal rays lighter; wholly white below.

Length.—280 mm.

The only specimen of this species which I have seen was kindly sent to me by Mr. Anderton, who says that it occurs in Otago Harbour and other inlets in the vicinity down to about 15 fathoms. Hutton does not mention whence his specimen was obtained, Günther records examples from Australia, Tasmania and the Auckland Islands.

RHOMBOSOLEA MILLARI sp. nov.

YELLOW BELLY.

Plate XXXVII.

Rhombosolea leporina Hutton, T.N.Z.I. v., 1873, p. 268, pl. xi. (not Günther).

Rhombosolea flesoides Hutton, *ib.* viii., 1876, p. 215. (not Günther).

B. vi.; D. 60; A. 40; V. 6; P. 12; C. 14 + 4; L. lat. 84; L. tr. 36 + 53; Vert. 12 + 20 = 32.

Length of head 3.1, height of body 1.8 in the length. Lower eye one-third in advance of the upper, orbital diameter 5.4 in the head, interorbital space smooth, equal to the depth of the eye: snout longer than the eye, anterior nostril of both sides with a skinny process behind, posterior nostrils with raised margins. The upper anterior profile is slightly bowed, the lower is straight.

Teeth.—The teeth are rather large, in several rows on the blind side only.

Fins.—The dorsal commences almost at the tip of the snout, the first ray is largely free and divided to its base, most of the rays are bifid, the posterior sixteen or so being simple. The 32-36 rays are equal and longest, being 2.5 in the head; the distance of the insertion of the last ray from the base of the outer caudal ray is 2.5 in the depth of the peduncle: ventral and anal continuous, the division corresponding to the absence of two rays, the vent occupying the position of the second one: the longest rays of the anal are slightly more than those of the dorsal, and occur at the 11-14th: the right pectoral is one-sixth longer than the left, being 2.0 in the head, the relative position of the two fins is the same: the caudal is 3.8 in the length, the margin is slightly rounded and the depth of the peduncle is one-half the length of the fin.

Scales.—As in *R. plebeia*, lateral line quite straight, with a branch continued forward to the margin above the middle of the orbit.

Colours.—Upper surface dark grey, with dusky markings, lower surface colourless or with scattered black spots.

Length.—442 mm.

This species was included in the collection made for me by Mr. J. J. Niven, in Hawke Bay. It was also forwarded by Mr. Anderton, who writes: "The Yellow-belly (*Rhombosolea flesoides*) is rare in Otago Harbour, it is common in Wycliffe Bay and Hooper's Inlet, but I have never known it to be taken by the trawlers outside the Heads."

On the other hand the species is tolerably well represented in our takings, but, as previously mentioned, I was not then in a position to identify the different members of the genus, which has proved to be a somewhat difficult task, an experience evidently also of previous workers on the group. The species is not referred to in the official report of the expedition, all records being entered as "Common Flounder (*Rhombosolea monopus*)."

In describing this prime food fish under a new name, I have been largely guided by a study of the description and figure published of Victorian specimens determined by me as *Rhombosolea flesoides*²³ with which species the New Zealand fish has been commonly associated.

It seems to differ in its non-overhanging and less free snout, its wider interorbital space, and its smaller number of fin rays, which are for the most part split; it differs notably in the more posterior insertion of the ventral fin and the non-imbricate scales, the arch in the lateral line above the pectoral also is less marked.

I have much pleasure in associating with this really valuable food fish the name of the Hon. J. A. Millar, Minister of Marine, by whose department the fisheries of the Dominion are controlled. He authorised the necessary expenditure for conducting the expedition, and it is due to the interest taken by him also, that it has been possible to publish the present report.

(23) Waite, Rec. Aust. Mus., vi., 1906, p. 197, pl. xxxv. Having left Sydney before this paper was printed, and not being able, therefore, to correct the proofs, I take this opportunity of making the following corrections:—

Page 197, for "fenibriated" read fimbriated.

Pp. 204 and 205, for fig. 1 read fig. 2.

Plate xxxvi. (explanation of), interchange figs. 2 and 4, also figs. 6 and 7.

RHOMBOSOLEA RETIARIA Hutton.

BLACK FLOUNDER.

Plate XXXVIII.

Rhombosolea tapirina Hutton, Trans. N.Z. Inst. v., 1873, p. 268, pl. xii. (not Günther).

Rhombosolea retiararia Hutton, *ib.* vi., 1874, p. 107.

B. vi.; D. 60; A. 43; V. 6; P. dex. et sin. 11; C. 12 + 6; L. lat. 77; L. tr. 23 + 31; Vert 9 + 20 = 29.

Length of head 3.6, height of body 1.8, and length of caudal 4.4 in the length: diameter of eye 7.1, interorbital space 9.0, and length of snout 4.7 in the head.

Head rounded, snout short and blunt; eyes on the right side, small, the lower about one-third in advance of the upper; mouth small, much more developed on the blind side; the maxilla is short, and does not extend to below the eye: nostrils in a smooth area in front of the eye, the former with a low rim. Upper and lower anterior profiles markedly rounded.

Teeth.—On the blind side only; they are small and in several rows.

Fins.—The dorsal fin commences close to the tip of the snout, the anterior rays are split at their tips, and the longest ones are 2.4 in the head; ventral and anal continuous, the longest rays of both fins are equal to those of the dorsal, the rays are co-terminal on the caudal peduncle; the right pectoral is the longer and 1.9 in the head; the caudal is slightly rounded and the depth of its peduncle is 1.5 in its length.

Scales.—On the head and anterior two-thirds of the body the scales are small, imbedded, and rather widely separated, thence they become larger and more closely set and towards the tail are distinctly imbricate.

Colours.—Dark olive green with darker mottlings, and with brick-red spots. These spots vary in size from a mere dot to areas as large as a pea; they are also irregular as regards their distribution, and are even found on the snout and eye membranes. Membrane of fins lighter olive with dark markings: dorsal anal and caudal with red spots; these spots recall the markings on the British Plaice, but are much more numerous; the dorsal and anal are bright orange in their hinder portions, and the posterior part of the caudal is blood-red: pectoral with two irregular dark bars. The left side of the head is flesh-coloured, without or with only slight markings, in noticeable contrast to the remainder of

the under side of the fish, which is yellowish olive, each scale edged with brown and suffusing the whole: the fins, the pectoral included, are almost as darkly coloured as on the upper side; in some specimens this colour is replaced with red.

Length.—314 mm.

This species was not taken by the trawler, but is included here for comparison with the other members of the genus, which as before stated, have been very vaguely described. I owe the specimens examined to Messrs. D. Hope and W. Cobeldick, Rangers for the Canterbury Acclimatisation Society, who have also kindly supplied me with the following information:—

This is regarded as a fresh-water flounder, and is also taken near the mouths of rivers, the chief source of supply in Canterbury being Lake Ellesmere, the fishes being caught where the rivers enter the lake, chiefly among the weeds. Here it is considered to be a winter fish, being very rarely obtained during the warmer months of the year, but the fishermen profess no idea as to where it migrates. The two specimens originally described were taken in the harbours of Wellington and the Bluff. Writing under the name *Rhombosolea monopus* (*R. plebeia*) Hutton²⁴ remarks: "A small flatfish, also called Patiki by the Maoris, is found in some of the rivers; it is brown, with red blotches on the upper side. I do not know whether it is identical with this species or not." This distinctly refers to the Black Flounder, which the Maoris on Banks Peninsula always speak of as "Patiki."

Once its characteristics are discerned this fish is readily distinguishable, its contour and the character of its snout well mark it as distinct from the Sand and the Greenback Flounders respectively, while the red spots on the body and the dark under side also serve to distinguish it from the Yellowbelly, it differs from the latter structurally, by its more rounded contour, blunter head, shorter snout, and smaller mouth and eyes.

It attains a length of $17\frac{1}{2}$ inches (= 445 mm.), and a weight of 5 pounds, and as specimens of this size are, according to Mr. Cobeldick, 3 inches in thickness (= 76 mm.), the fish is a very fleshy one.

Owing to the enormous number of eels occurring in the lake, the flounders obtained are very commonly mutilated, a certain proportion having suffered the loss of portions of their fins and tails, while some exhibit much more extensive wounds.

(24) Hutton, Cat. Fish N.Z., 1872, p. 52.

AMMOTRETIS Günther, 1862.

Two species of this genus were taken, one of which is regarded as undescribed. The three known species may be thus distinguished:—

- a. Ctenoid scales on both sides of body, dorsal and anal fin rays scaly *rostratus*.
- aa. Ctenoid scales on right side of body only, no scales on dorsal or anal fin rays
- b. Rostral hook very long, interorbital space wide, body with large blotches *nudipinnis*.
- bb. Rostral hook small, interorbital space narrow, body with spots forming lines *guntheri*.

A. rostratus is an Australian and Tasmanian species. *A. nudipinnis* and *A. guntheri* are known only from New Zealand.

AMMOTRETIS NUDIPINNIS Waite.

TURBOT.

Plate XXXIX.

Ammotretis rostratus Hutton, T.N.Z.I. viii., p. 215 (not Günther).

Ammotretis nudipinnis Waite, Proc. N.Z. Inst., 1911, p. 50.

Station 80.

B. vii. D. 85; A. 60; V. dex. 7, sin. 4; P. dex. 11, sin. 12; C. 14 + 4; L. lat. 82; L. tr. 33 + 48.

Length of head 3.6, height of body 1.7, length of caudal 4.7, in the length, diameter of eye 9.2, length of snout 3.2 in the head.

The rostral hook is very long, extending downwards below the level of the maxilla, mouth large; lower lip with a fringe of ten rays on the right side. Eyes on the right side on the same level, interorbital space wide, equal to the longitudinal diameter of the eye: gill membranes not broadly united below, gill rakers short.

Teeth.—A broad band of small teeth in each jaw on the left side only.

Fins.—The dorsal rays commence at the tip of the rostral hook, the first five or six are free, the longest rays occur between the 36th and 46th, and, measured from the edge of the sheath on the right side, are contained three times in the head: the

sheath is lower on the left side by an eye diameter, thus exposing a longer ray: the anal is similar to the dorsal and is coterminous with it, close to the outer caudal rays: the right ventral is very long, commencing at the tip of the proventral and connected with the anal; the base of the last ray of the left ventral is opposite to the vent: the pectorals are short and subacute, the right one is slightly the longer, measuring 2.1 in the length of the head: the caudal is of moderate length, acutely rounded; the peduncle is not an eye diameter in length, and its depth is 4.3 in that of the body.

Scales.—Strongly ctenoid on the right, smooth on the left side. The head is wholly scaly, with the exception of the snout on the right side; lateral line slightly arched over the pectoral and the circumorbital area, thence straight to the base of the caudal rays. No scales on the fin rays, the caudal excepted, in which the basal half of the rays are scaly.

Colours.—General colour above warm brown, reddish towards the margins of the body, irregularly blotched with dark brown. Under side colourless or more or less blotched.

Length.—482 mm.

This species was trawled only at Station 80, in Porangahau Bay, northward of Cape Turnagain, in 16-17 fathoms, but Mr. Niven kindly gave me examples taken by his trawlers in Hawke Bay.

The principal differences between this species and *A. rostratus*, with which it has been associated, appear to be the scaleless dorsal and anal fins, the smooth character of the scales on the left side, and the wide interorbital space.

In his generic diagnosis Günther states that the "dorsal and anal rays are branched and scaly." In erroneously assigning *Rhombosolea bassensis* Castelnau to the genus *Peltorhamphus*, I²⁵ overlooked the fact that Ogilby²⁶ had previously examined Castelnau's type, and had determined it as *Ammotretis rostratus* var. *adspersus* Kner. In my description of the specimen I stated that the head, body and fins were wholly clothed with small ctenoid scales, and the scales on the fins are represented in the figure. I further stated that the ctenoid scales were almost equally developed on both sides, and, as Günther does not differentiate between the two, ctenoid scales were presumably present on both sides of the type specimen. Kner²⁷ also found ctenoid scales on the left side.

(25) Waite, Rec. Aust. Mus., vi., 1906, p. 198, pl. xxxiv.

(26) Ogilby, Cat. Fish. N.S. Wales, 1886, p. 49.

(27) Kner, Voy. Novara Fische, 1867, p. 287.

AMMOTRETIS GUNTHERI Hutton.

BRILL.

Plate XL.

Ammotretis guntheri Hutton, T.N.Z.I. v., 1873, p. 267.

Stations 34, 65.

B. vii.; D. 90; A. 66; V. dex. 10, sin. 5; P. dex. et sin. 11; C. 12 + 6; L. lat. 94.

Length of head 4.8, height of body 1.8, length of caudal 5.1; diameter of eye 7.6, length of snout 3.8 in the head.

The rostral hook does not extend beyond the level of the lower eye, mouth small, lower lip with a fringe of ten rays on the coloured side only; lower eye half a diameter in advance of the upper one, interorbital space narrow, half the vertical diameter of the eye: gill membranes moderately united below, gill rakers very short, reduced to a mere fringe.

Teeth.—A narrow band of small teeth on the lower side of both jaws.

Fins.—The dorsal rays commence at the tip of the snout, the first seven or eight being quite free, the rays on the head are elongate, those of the body are moderately uniform in length and short, the longest not exceeding a third of the head: the anal is quite similar and is coterminous with the dorsal, quite close to the base of the outer caudal rays; the right ventral corresponds to the anterior dorsal rays and the left, which lies opposite to the vent, has the rays similarly produced: the pectorals are very short, the right one being 1.8 and the left one 2.3 in the head; they are evenly rounded, the longest rays being in the middle: the caudal is short and boldly rounded. Owing to the juxtaposition of the dorsal and anal rays there is no distinct peduncle, the depth at this point being 3.2 in the height of the body.

Scales.—Strongly ctenoid on the right, smooth on the left side, entire head on both sides, including the interorbital space, scaly; lateral line with a low arch over the pectoral, thence straight to the base of the caudal rays; the dorsal and anal fins are sheathed, the sheaths being more extensive on the right side, but there are no scales on the rays, the basal third of the caudal is wholly scaly, and scales are continued up the separate rays for another third.

Colours.—General colour above brownish grey, each scale with a black mark on its outer edge; these form longitudinal lines

on the body but are in places somewhat irregularly disposed. The anterior dorsal and the ventral rays are reddish, the dorsal and usually the anal and caudal are dark brown towards their free edges narrowly margined with a reddish tinge: under side colourless, or blotched with grey.

Length.—420 mm.

This species was only once taken off the mainland, namely, near Timaru, in 16 to 21 fathoms. It was also secured off the Chatham Islands, south of Port Hutt, in 24-33 fathoms, both occurrences being on a sandy bottom.

PELOTRETIS Waite, 1911.

Eyes on the right side, the lower advanced, the upper close to the profile; mouth small, subsymmetrical; teeth villiform, on the blind side only, no vomerine or palatine teeth. The dorsal commences behind the snout, and is not connected with the caudal; two ventrals, the right one in the same line and continuous with the anal. Scales moderate, ctenoid on the right side, cycloid on the left, lateral line nearly straight. Gill openings narrow, the membranes broadly united below the throat; gill-rakers short and conical.

This genus differs from *Ammotretis* by the small subsymmetrical mouth, the large eyes, the upper of which is close to the profile, the backward origin of the dorsal fin and the absence of any rostral hook.

PELOTRETIS FLAVILATUS Waite.

LEMON SOLE.

Plate XLI.

Pelotretis flavilatus Waite, Proc. N.Z.I., 1911, p. 50.

Stations 20, 21, 23, 25, 26, 28, 29, 31, 34, 35, 39, 40, 41, 43, 44, 46, 47, 48, 49, 50, 51, 52, 54, 58, 62, 64, 65, 66, 67, 69, 70, 71, 72, 73, 74, 76, 78, 81, 86, 87, 94.

B. vii.; D. 89; A. 71; V. dex. 7, sin. 5; P. dex. 12, sin. 11; C. 13 + 4; L. lat. 78; L. tr. 26 + 39; Vert. 11 + 31 = 42.

Length of head 4.8, height of body 1.8, length of caudal 5.0 in the length: diameter of eye 3.9 in the head. The eyes are large, crowded to the front of the head, and the upper one is close to the dorsal edge, which is incised so that the eye can be seen from the under side: lower eye slightly advanced a small knob in front of it; this eye is separated from the maxilla by a narrow ridge only.

Teeth.—Present on the blind side only.

Fins.—The dorsal fin begins above the front edge of the eye and none of the rays is entirely free; the longest rays are about the middle of the fin and are 2.2 in the length of the head, the rays are slightly sheathed, the sheath being more extensive on the right side: the anal is similar to the dorsal and is coterminous with it: the right ventral is but slightly separated from the anal; the left is small, a little longer than the eye; it covers the vent, which is behind its base: the right pectoral is longer than the left, 1.5 in the head, both are strongly rounded: the caudal is slightly rounded, and the depth of the peduncle is 4.5 in that of the body.

Scales.—Ctenoid on the right side, entire but striated on the left, the lips and the proventral on the blind side are naked, otherwise the whole head is scaly, the scales being imbricate; they clothe the fin rays also, the ventrals and anterior rays of the dorsal and anal excepted.

Colours.—Grey or brown above, both body and fins with irregular though well defined markings, sometimes absent: underside yellow.

Length.—311 mm.

This species was taken almost throughout the cruise including the Chatham Islands, and at all depths from $9\frac{1}{2}$ to 50 fathoms.

Though so common, and sold in all the fish shops of the Dominion as "Lemon Sole," it does not appear to have been previously named. This may be accounted for by confusion in the application of the common name. In the official report the Stations are correctly given under Lemon Sole, to which however the name *Ammotretis rostratus* is wrongly applied, but it should be mentioned that the misidentification is of much older date than the report referred to.

PELTORHAMPHUS Günther, 1862.

PELTORHAMPHUS NOVÆ ZEELANDIÆ Günther.

SOLE.

Plate XLII.

Peltorhamphus novae-zeelandiae Günther, Cat. Fish. Brit. Mus. iv., 1862, p. 461. Hutton, Cat. Fish. N.Z., 1872, p. 52. Hector, *ib.* p. 117, pl. ix., fig. 84.

Stations 9, 10, 11, 32, 33, 34, 40, 41, 43, 45, 62, 70, 73, 76, 78, 80, 81.

B. v.; D. 100; A. 67; V. dex. 6, sin. 4; P. dex. et sin. 10; L. lat. 108; L. tr. 33 + 34; Vert. 10 + 27 = 37.

Length of head 4.1, height of body 2.0, length of caudal 4.8 in the length; diameter of eye 7.1, and length of snout 3.0 in the head.

The front portion of the head is formed by the rostral hook, which entirely covers the mouth, and its hinder edge forms a vertical notch about an eye diameter in depth: the small eyes are placed a diameter apart and more than two diameters from the front of the head, the upper eye is slightly advanced and is placed further from the dorsal edge than is the lower eye from the ventral edge: the nostrils lie in a naked area nearer to the lower than to the upper eye: the upper maxillary is small, not more than an eye diameter in length, while the lower one is twice and a half times the same; gill-rakers short and conical, fourteen on the lower limb of the first arch; preopercle adnate.

Teeth.—Teeth on the lower jaw, none on other bones of the head.

Fins.—The dorsal fin begins almost at the tip of the rostral hook, the anterior rays are free, thence less so to at least above the eyes; they extend quite close to the base of the caudal rays: the right ventral and anal are continuous, and on the coloured side the ventral rays do not appear to be much the longer, on the blind side they are twice the length, the left ventral is very small, placed in front of a decided drop in the profile which occurs immediately behind the vent: the anal is otherwise similar to the dorsal, the longest rays being 3.3 in the head. Owing to the extended sheath the depth of the body on the right side is greater than that of the left. The right pectoral is long, 1.4 in the head, its second ray is produced, being an eye diameter longer than the head, the left pectoral is less than half the length of the head: the caudal is rounded and its peduncle is about one-fifth the depth of the body.

Scales.—The whole of the head, excepting the small areas, containing the nostrils, and the entire body is covered with imbricate ctenoid scales, the under side is equally scaly, but the scales are smooth, there are some large open pores in the neighbourhood opposite to the eyes and along the margin of the preopercle, and several rows of large papillæ on the head, one such runs from the front of the mouth, upwards and backwards, another between this and the dorsal margin, while a third borders the maxillary: the upper and lower sides of the caudal and the right pectoral rays are for the greater part covered with small scales, but there are no scales on the other fins.

Colours.—Greenish grey above, without markings, wholly white below.

Length.—392 mm., obtained up to 415 mm.

This well known fish occurred throughout the area examined, and was also taken at the Chatham Islands. It was secured between the extremes of 9 and 50 fathoms.

The sole is so characteristic that there is no danger of confusing it with any other species, it is commonly called English Sole, and believed to be identical with *Solea vulgaris*, but is immediately distinguishable by the large rostral hook which wholly conceals the mouth on the right side, the long pectoral fin with its elongated second ray, the ventral fin arising beneath the mouth, and the freer caudal.

PERCOMORPHI.

Family SERRANIDÆ.

POLYPRION Cuvier, 1817.

POLYPRION PROGNATHUS Forster.

HAPUKA.

Plate XLIII.

Perca prognatha Forster. in Bloch and Schneider, Syst. Ichth., 1801, p. 302.

Polyprion prognathus Günther. (See Boulenger, Cat. Fish. Brit. Mus., 1895, p. 150, for synonymy).

Stations 2, 3, 8, 9, 12, 13, 14, 15, 16, 25, 26, 27, 28, 29, 36, 39, 42, 43, 48, 49, 54, 73, 84, 86, 87, 89, 90, 91, 92, 95.

B. vii.; D. xi., 12; A. iii. 9; P. 17; V. i. 5; C. 14 + 14.

Length of head 2.6, height of body 3.3, length of caudal 4.4 in the total; diameter of eye 6.1, interorbital space 3.6, length of snout 3.4, and of the longest (5th) dorsal spine 2.9 in the head. The anal rays are variable in number, ranging from eight to ten.

Though represented at many Stations, but few individuals were usually taken together. On four occasions only did the number exceed ten, they were: Station 13, 47 fishes; Station 15, 20 fishes; Station 16, 14 fishes; and Station 27, 17 fishes. As mentioned in the introduction (p. 53) large catches of Hapuka were made by means of hand lines at the Chatham Islands, and the opinion was ventured that these islands would in the future become important fishing grounds for the Dominion.

The stomachs of different individuals yielded examples of *Clupea neopilchardus*, *Syngnathus norae* and species of Cephalopods.

HYPOPLECTRODES Gill, 1862.

HYPOPLECTRODES SEMICINCTUS Cuvier and Valenciennes.

HALF-BANDED SEA PERCH.

Plectropoma semicinctum Cuvier and Valenciennes, Hist. Nat. Poiss. ix., 1833, p. 442.

Plectropoma huntii Hector, T.N.Z.I. vii., 1875, p. 240, pl. x., fig. 1.

This species was found to be very common off the Chatham Islands and usually caught on the lines employed for Blue Cod (*Paraperca*) and Hapuka (*Polyprion*). I have also seen specimens caught off Kaikoura in the South Island.

Family HISTIOPTERIDÆ.

ZANCLISTIUS Jordan, 1907.

ZANCLISTIUS ELEVATUS Ramsay and Ogilby.

LONG-FINNED BOAR FISH.

Histioporus elevatus Ramsay and Ogilby, Proc. Linn. Soc. N.S.W. (2) iii., 1888, p. 1311. Waite, Mem. Aust. Mus. iv., 1899, p. 114, pl. xxvi.

Zanclistius elevatus Jordan, Proc. U.S. Nat. Mus. xxxii., 1907, p. 236.

B. vi.; D. vi., 28; A. iii. 14; V. i. 5; P. 16; C. 17.

Among the sixteen species of fishes taken in the Bay of Plenty, after I left the vessel, is a single example of this fish, the first and only specimen known from New Zealand waters. As the number of the Station and the depth, etc., were not reported to me, I am unable to give a more exact locality. The length of the specimen is 300 mm.

In 1903 I²⁸ published a note on the nomenclature of some members of the family Histiopteridæ, and mentioned that *Pentaceros* was not available for fishes, being preoccupied in the Asteroidea. Later, Jordan²⁹ proposed the name *Quinquarius* to replace *Pentaceros*, while more recently, writing with R. E. Richardson³⁰ he states that "The name *Pentaceros* Cuvier and Valenciennes is apparently not preoccupied, as recently sup-

(28) Waite, Ann. Mag. Nat. Hist. (vii). 12, 1903, p. 288.

(29) Jordan, Proc. U.S. Nat. Mus. xxxii. 1907, p. 236.

(30) Jordan and Richardson, Mem. Carnegie Mus. iv. 1909, p. 192.

posed by Jordan, Proc. U.S.M. xxxii., 1907, p. 238. The first use of the name *Pentaceros* for a starfish by Schultze, 1760, is nonbinomial, according to Dr. Walter K. Fisher." These authors therefore use *Pentacerotidae* as the name of the family.

In his review of the Histiopтерid Fishes of Japan, Jordan³³ has supplied a useful key to all the genera of the family. The genera as applied to Australasian species are:—

Zanclistius gen. nov. for *H. elevatus* Ramsay and Ogilby.

Richardsonia Castelnau for *H. labiosus* Günther and *H. farnelli* Waite.

Pentaceropsis Steindachner for *H. recurvirostris* Richardson.

The two species first named are found in New Zealand waters.

MACCULLOCHIA Waite, 1910.

Maccullochia gen. nom. nov. Waite, Proc. N.Z. Inst., 1910, p. 25.

This name was proposed to replace *Richardsonia*, applied by Castelnau to *Histiopтерus labiosus* Günther in 1872. *Richardsonia* was first used by Steindachner in 1866 for *Argentina retropinna*, and is not therefore available for this family. The name *Maccullochia* is applied in recognition of the esteem in which I hold my former pupil, Mr. A. R. McCulloch, now Zoologist Australian Museum, Sydney. The type of the genus is *M. labiosa* Günther.

Respecting this species Mr. McCulloch, who is examining the fishes collected on the Federal trawler "Endeavour," tells me that he has a large series, and notwithstanding the differences exhibited by the type of *H. farnelli*, he finds every link connecting it with *H. labiosus*, of which it proves to be the young. The name therefore becomes a synonym of Günther's species.

Family CEPOLIDÆ.

CEPOLA Linnæus, 1766.

CEPOLA AOTEA Waite.

BAND FISH.

Plate XLIV.

Cepola aotea Waite, Proc. N.Z. Inst., 1910, p. 26.

Stations 89, 95.

B. vii.; D. 74; A. 69, V. i. 5, P. 20; C. 6 + 4.

Length of head 9.8, height of body 12.6, in the length; diameter of eye 3.0, interorbital width 6.0, and length of snout

5.1 in the head: depth of head 1.4 in its length, the large eye almost cuts the profile: the mouth resembles that of a bull dog, the lower jaw protruding and fitting into a notch in the upper one, the anterior teeth remaining without when the mouth is closed: the preopercle is unarmed, and the maxilla extends to below the middle of the eye: the gill-rakers are long and slender and finely spinous, they are forty-nine in number on the first arch, thirty-two being on the lower limb.

Teeth.—The teeth in the jaws are in single series, but there is a patch in front of the lower jaw, the anterior teeth of which are strongly curved: there are no teeth on the vomer, palatines or tongue.

Fins.—The dorsal commences above the edge of the opercle, its rays are articulated and branched: the anal arises less than the length of the head behind the opercle; the pectoral is rounded, its eighth ray being half the length of the head: the ventrals are longer, twice the diameter of the eye: the caudal rays are absent, their roots only remaining.

Scales.—The scales, left on portions of the body, are extremely small.

Colours.—No colour remains after the partial digestion of the fish, but there is a conspicuous black spot on the membrane between the maxilla and premaxilla: no mark traceable on the dorsal fin.

Length (to base of caudal rays).—353 mm.

The specimen described was obtained from the gullet of a *Zeus* trawled at Station 89. Two smaller ones, measuring 74 and 47 mm. in length respectively were taken from the stomach of *Pagrosomus* at Station 95, all occurrences being in the Bay of Plenty.

This species is a true *Cepola*, as restricted by Bleeker, and may prove to be not distinct from the European form *C. taenia*, the fin rays and the presence of the maxillary spot being identical, features also possessed by the Japanese *C. schlegeli* Bleeker. Pending absolute comparison it has been given a distinctive name. The Australian *C. australis* Ogilby differs from all by having a much smaller number of rays in the dorsal and anal, and also by the absence of the black spot noticed in the other forms.

As to the systematic position of the *Cepolida*, Boulenger³¹ writes: "Although these fishes have hitherto been placed near the *Blenniidae*, the *Gobiidae*, or the *Trachypteridae*, they are nothing

(31) Boulenger, Camb. Nat. Hist. vii. 1904, p. 662.

but extremely elongate Perches, and they stand in the same relation to the *Serranidae* as the *Trichiuridae* to the *Carangidae* and *Scombridae*."

In their review of the *Cepolidae* of Japan, Jordan and Fowler³² publish details of the decades of the Fishes of the "Faunæ Japonica." The pages attributed to Decades x.-xiv., have been also printed for Decades vii.-ix., for which the figures should be pages 113-172, 1845.

Family SCIÆNIDÆ.

ARRIPIS Jenyns, 1840.

ARRIPIS TRUTTA Forster.

KAHAWAI.

Sciaena trutta Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 542.

Centropristes salar Richardson, Voy. Ereb. and Terr. Fishes, 1845, p. 29, pl. xx., figs. 4-6.

Stations 71, 72, 73.

The only occasions on which the Kahawai was taken were in three successive hauls in Palliser Bay, the depths ranging from 11 to 38 fathoms.

It was taken somewhat more freely during the period of the extended cruise, but it is more than probable that the trawl did not secure all those encountered, for the fish is a very rapid swimmer, and would probably move off at the first sensation of the vibrations caused by the passage of the trawl.

Family LATRIDIDÆ.

LATRIS Richardson, 1840.

LATRIS LINEATA Forster.

TRUMPETER.

Sciaena lineata Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 342.

Latris hecateia Richardson, P.Z.S., 1839, p. 98, and T.Z.S. iii., 1842, p. 106, pl. vi., fig. 1.

Station 48.

The Trumpeter was but once taken in the trawl, a single specimen being obtained, east of Lyttelton in 44-46 fathoms.

(32) Jordan and Fowler, Proc. U.S. Nat. Mus. xxvi. 1903, p. 701.

Two specimens of *Tripterygion varium* Forster were taken from its gullet. Another example was caught on a long line off the Chatham Islands.

LATRIS CILIARIS Forster.

MOKI.

Sciaena ciliaris Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 310.

Latris ciliaris Richardson, Voy. Ereb. and Terr. Fishes, 1845, p. 37, pl. xxvi., fig. 6-7.

Stations 13, 14, 25, 46, 57, 71, 73, 76, 77, 85.

Though taken generally between Otago Harbour and Hawke Bay, the number of Moki secured by the trawl was not great. The fishes were taken between the vertical limits of 11 and 43 fathoms. During the extended period it was secured in large numbers in Great Exhibition Bay, almost at the northern extremity of the Dominion. When at the Chatham Islands we set nets and secured it in company with Tarakihi (*Cheilodactylus macropterus*) and other species.

Family CHEILODACTYLIDÆ.

CHEILODACTYLUS Lacépède, 1803.

CHEILODACTYLUS MACROPTERUS Forster.

TARAKIHI.

Plate XLV.

Sciaena macroptera Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 342.

Stations 15, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 34, 35, 36, 37, 38, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 54, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 73, 74, 75, 76, 78, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96.

B. vi.; D. xviii. 28; A. iii. 15; V. i. 5; P. 9 + 6; C. 16 + 6; L. lat. 59; L. tr. 7 + 17.

Length of head 3.4, height of body 2.2, length of caudal 6.4 in the length; diameter of eye 3.5, interorbital space 4.0, and length of snout 2.1 in the head.

Upper profile of head sinuous, tumid over the snout and eye, interorbital space convex, but not sharp, mouth small and sub-horizontal the maxilla extending no further than the anterior nostril, lips thick, the upper jaw the longer.

The profile of the back rises suddenly from the occiput, thence gradually to the base of the eighth dorsal spine, whence it falls to the caudal peduncle, the dorsal edge is sharp throughout its length, the lower profile of the body is more even but tumid behind the throat and is sharp and ridged to between the ventral fins, it is rounded only beneath the caudal peduncle.

Teeth.—Teeth villiform, in a band in each jaw with a slightly enlarged outer series.

Fins.—The dorsal commences above a point within the opercular margin, its seventh spine is the longest, 2.8 in the head, and longer than the rays: the anal has a short base, it commences beneath the fourth dorsal ray and terminates an eye diameter before the end of the dorsal; the second spine is the longest, the hinder rays are elongated reaching beyond the base of the dorsal: the ventral arises beneath the longest dorsal spine which its own spine exceeds in length, the fin reaches to the vent: the two upper and seven lower rays of the pectoral are simple, of the latter the second is greatly elongated, reaching the base of the seventh anal ray, its length equals the height of the body or 2.2 in its length; it is one-half longer than the head, and is slightly fringed above and below: the caudal is deeply forked, the peduncle is low, little more than the diameter of the eye.

Scales.—The snout is naked, the upper part of the head, cheeks and opercles are covered with small scales, a band of small scales also extends behind the opercle downwards to the pectoral, the rest of the body is covered with moderate cycloid scales; the lateral line has a low even curve, passes near to the upper edge of the peduncle, thence drops to the central ray of the tail.

Colours.—Silvery, with a purple tint along the back; inner side of opercles black, showing through the membranes; a black band crosses the back in front of the dorsal fin, it extends below the lateral line but fails to reach the pectoral fin. In young examples there are, in addition, four other but fainter bands, one beneath the middle and another beneath the hinder spines of the dorsal, one beneath the middle rays and the last on the upper surface of the caudal peduncle: occasionally all the five bars persist, but usually only the first remains, and even this may disappear in old examples. Young specimens also exhibit about six longitudinal lines of brownish hue: the fins may be slightly clouded but without distinct markings.

Length.—267 mm.

Of all the fishes taken, economic or otherwise, this was the most ubiquitous species secured. After passing the Otago Peninsula, it was represented in every haul of the net with but few exceptions, and some of these Stations are charted as "net fouled" when no fishes of any kind were obtained. It was taken at the Chatham and Pitt Islands by means of set nets and hand lines. Not only was it so freely distributed but occasionally it was taken in enormous numbers; 1000 examples were counted in one haul, while a more careful census made at another Station, revealed 1650 specimens.

Operations conducted during the period of the extended charter shows that it is generally distributed over the area traversed, and as I with others have hooked it in the Sounds of the West Coast, it may be said to frequent the whole of the New Zealand seas.

Family SPARIDÆ.

PAGROSOMUS Gill, 1893.

PAGROSOMUS AURATUS Forster.

SCHNAPPER.

Labrus auratus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 266.

Stations 9, 71, 72, 73, 74, 75, 76, 77, 78, 80, 81, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96.

The Schnapper is regarded as a northern species in New Zealand waters, and Hector writes: "The Schnapper is not reported to occur south of the Kaikoura Peninsula." It was therefore with considerable surprise that a single example was found included in the catch at Station 9, made off the mouth of the Clutha River, south of Otago, in 15-50 fathoms. This record is the more remarkable when, as the trawler records show, it was not again taken until the net was dragged outside Wellington Harbour, whence it was secured at almost every subsequent haul, the extremes of depths being 11 to 105 fathoms.

In the introduction I referred to the plenitude of Schnapper in the Bay of Plenty, and wrote (p. 54): "Large hauls of Schnapper were made, and so great was their buoyancy when drawn from the deep water that they not only brought the net and its contents to the surface, but, in addition, supported the weight of Mr. Alward, our chief engineer, who jumped boldly on to the net. It was some time before the fish slipped away

from under his feet sufficiently to sink him to the chest, and in this situation I photographed him (Plate vi., fig. 1)."

At the final Station charted by me, 1178 Schnapper were taken in the net, but later hauls were even more productive, as the following records, taken from the official report, will indicate: "Upwards of 2 tons of fish, mostly large Schnapper, were taken at Station 102." At Station 103 a similar number was obtained, while at Station 104, 2250 Schnapper were netted. Station 106 yielded about 2000 examples. Although I examined several thousand specimens during the cruise, I did not find a single example in which the large humps on the snout or back, so characteristic of the New South Wales "Old Man Schnapper" were in any way indicated, though specimens quite as large as Australian individuals were secured.

In New South Wales the Schnapper is usually taken, on rough or rocky bottoms, in fact the line fishermen sometimes speak of such areas as "Schnapper ground."

The fish is by no means confined to such situations in the seas around New Zealand, but, on the contrary, appeared rather to favour clean ground, for the great hauls of Schnapper previously mentioned, were taken on clean sandy flats.

It is doubtless largely a matter of food. Remains of molluscs were generally found in the stomachs, together with indeterminate fishes; on one occasion, namely, at Station 95, in the Bay of Plenty, two examples of *Cepola aotca* were taken from the stomachs of Schnappers.

Family LABRIDÆ.

PSEUDOLABRUS Bleeker, 1861.

The following is a synopsis of the New Zealand species of the genus, the fin formulæ being:—D. ix. 11; A. iii. 10; V. i. 5.

- a. Scales on cheeks in five or more rows.
 - b. Dark markings on body.
 - c. Dark spots on or above the lateral line *celidotus.*
 - cc. A black bar across the body .. *cinctus.*
 - bb. No dark markings on body .. *coccineus.*
- aa. Scales on cheeks in less than five rows
 - d. Six dark transverse bars on body *pittensis.*
 - dd. Two or three longitudinal bands on body *lati clavus.*
 - ddd. No dark markings on body .. *fuscicola.*

The following four species were obtained:—

PSEUDOLABRUS COCCINEUS Forster.

SCARLET PARROT FISH.

Plate XLVI.

Labrus coccineus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 264.

Julis? rubiginosus Richardson, Ann. Mag. Nat. Hist. xi., 1843, p. 425.

Labrichthys roseipunctata Hutton, T.N.Z.I. xii., 1880, p. 455.

This large and very handsome species was not taken in the trawl, but was obtained by means of hand lines off the Chatham Islands. It is of brilliant scarlet colour when first removed from the water, with a longitudinal pink line along each row of scales, and some examples have a dark purple vertical mark on each side also; there are about five rows of ocellated pink spots on the dorsal fin and a similar series on the anal; the pectoral and ventral are without markings; a broad dark brown bar passes across the extremity of the caudal peduncle, the outer margins of the caudal lobes, which are considerably produced are also dark brown; the caudal fin is dusky, either wholly or at its distal extremity.

Length.—The largest example obtained measures 355 mm. in length.

Julis? rubiginosus Richardson, which was placed by Günther with unidentified species, is without doubt a synonym of this species, the description of Parkinson's figure applying well to our specimens.

P. roseipunctatus is probably the same species also, differing only in the absence of the dark band across the caudal peduncle, possibly a condition of immaturity, the type specimen being but six inches (152 mm.) in total length.

PSEUDOLABRUS CELIDOTUS Forster.

SPOTTY.

Labrus celidotus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 265. Richardson, Voy. Ereb. and Terr., 1846, p. 53, pl. xxxi., fig. 1.

Labrus botryocosmus Richardson, *ib.*, 1846, p. 53, pl. xxxi., fig. 6.

Station 28.

Of all the New Zealand Labroids, this is the species best known to line fishermen in the South Island. It was but once taken in

the trawl, when a few examples were obtained off Oamaru in 19-22 fathoms, on a sandy bottom. Richardson's figures fairly represent the markings, the most characteristic of one form being the dark spot on the lateral line, whence the name "Spotty." Being drawn, doubtless, from a spirit preserved example, it indicates a contracted appearance about the head, a feature far from the truth, and one common to many of Richardson's illustrations.

The specimens trawled include both forms, that is, examples represented by the names *P. celidotus* and *P. botryocosmus*. A careful examination has confirmed the opinion I held that the two are not specifically distinct but represent colour varieties, possibly of sexual import; the case may be analagous to the two forms of *Diastodon* occurring in the waters of New South Wales, *D. unimaculatus*, and *D. bellis*, and of which Ogilby³³ wrote: "For some time we inclined to the opinion that the differences were merely sexual, but the examination of specimens of both sexes belonging to either form has induced us to recede from that position. It must be borne in mind that notwithstanding the fact that the differences in the coloration is not always concurrent with the differences in the sexes, yet we may have here two distinct varietal races living under similar conditions and inhabiting the same waters, but which, nevertheless preserve intact their colour variations."

Respecting the *Pseudolabri* the differences are chiefly those of colour markings. In *P. celidotus* there are two marks behind the eye, a series of black spots above the lateral line, and below them, on the lateral line, just beyond the tips of the pectoral, a large black blotch; sometimes, also, other two marks, one beneath the middle of the soft rays and the other below the termination of the dorsal fin. Occasional specimens exhibit a longitudinal band on the dorsal fin. In the *botryocosmus* form the postocular marks are absent as is also the large blotch on the side, but the smaller spots above the lateral line are retained. In addition to the band on the dorsal fin, there is a similar one on the anal.

Richardson states that the branchings of the tubules on the posterior scales of the lateral line are simpler than in *P. celidotus*, but this is a variable character, for in some specimens the tube is simply forked, whereas some examples of the *botryocosmus* form exhibit complex branchings on the posterior scales, equally with those on the more anterior portion.

(33) Ogilby, Edible Fishes, N.S. Wales, 1893, p. 138.

PSEUDOLABRUS CINCTUS Hutton.

GIRDLED PARROT FISH.

Plate XLVII.

Labrichthys cinctus Hutton, T.N.Z.I. ix., 1877, p. 354.

Length of head and height of body 2.9, length of caudal 3.7 in the total; diameter of eye 6.1, interorbital space 3.5, length of snout 2.7 in the head.

There are five rows of scales on the cheeks and four on the opercle. The posterior canine tooth is exposed when the mouth is closed.

Fins.—The dorsal fin commences over the margin of the opercle and the anal arises midway between the end of the snout and the tips of the caudal rays: the pectoral carries a dark band at its base, and the characteristic black body band passes from the 6-8 dorsal spines to the space between the ventrals and anal, being inclined slightly backwards below, it is about three scales in width.

This well marked species was originally taken off the coast of Otago, and I am unaware if it has been recognised since. I caught two specimens on the line fishing from the wharf at Napier, and these were the only examples seen by me. The larger measures 300 mm. in length.

PSEUDOLABRUS PITTENSIS Waite.

BANDED PARROT FISH.

Plate XLVIII.

Pseudolabrus pittensis Waite, Proc. N.Z. Inst., 1910, p. 26.

D. ix. 11; A. iii. 10; V. i. 5; P. 13; C. 14 + 11; L. lat. 25; L. tr. 4 + 9.

Length of head 2.7, height of body 2.6, length of caudal 3.4 in the total: diameter of eye 7.0, interorbital space 4.0, and length of snout 2.9 in the head.

The head is evenly rounded above and below, and the jaws are equal; gill-rakers short and pointed, seventeen on the first arch, twelve of which are on the lower limb.

Teeth.—The teeth are in a single series, exclusive of the large canines in front; the posterior canine teeth are concealed when the mouth is closed.

Scales.—There are four series of scales on the cheek and some larger ones on the opercle. No sheath at the base of the dorsal and anal fins, basal half of caudal clothed with scales. Lateral line continuous, bent downwards beneath the hinder dorsal rays.

Fins.—The membrane of the dorsal spines is longer than the respective spine, and the anal is similarly formed: caudal truncate or feebly rounded, the depth of its peduncle 1.9 in the length of the head.

Colours.—The colour in preservative is purplish, darker above, and yellow beneath. The body is ornamented with six dark bands, which do not reach the lower edge, the first is close behind the head, embracing the tip of the opercle, the last is on the caudal peduncle; these dark bands extend on to the dorsal fin including the membranes of the spines and rays as follows:—First band, spines, 1-4; second band spines, 5-7; third band, spine, 9-ray, 3; fourth band, rays, 5-7; fifth band, rays, 8-11; the pectoral has a purple bar across its base and the distal two-thirds of the ventrals are black.

Length.—271 mm.

This species was taken off Pitt Island, one of the Chatham Group, by means of hand lines, during the visit referred to in the introduction, p. 53.

Family SCARIDÆ.

CORIDODAX Günther, 1862.

CORIDODAX PULLUS Forster.

BUTTER FISH.

Plate XLIX and fig. 3.

Scarus pullus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 288.

B. vi.; D. xxii. 13; A. iii. 12; V. 0.5; P. 15; C. 12 + 6; Vert. 27 + 19 = 46; L. lat. 80; L. tr. 12 + 32.

Length of head 4.4; height of body 3.2 and length of caudal 3.7 in the total: diameter of eye 6.3, interorbital space 2.4 and length of snout 3.5 in the head.

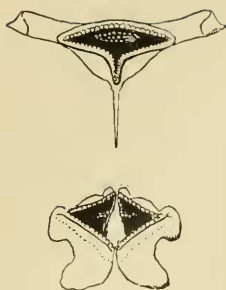


fig. 3.
Pharyngeal teeth of
Coriodax pullus.

Head short and blunt, the broad inter-orbital space is very convex, mouth small with reflexed lips, maxilla not reaching to below the eye, a broad frenum in both jaws; gill-rakers short and weak, about thirteen on the lower limb of the first arch; opercle with a large thin flap. The body is elongate, the upper and lower profiles being similar.

Teeth.—Wholly coalescent sub-equal in size not united on the mid line. Exposed portion of pharyngeal teeth diamond-shaped, the central depression being four times as broad as long.

Fins.—The dorsal fin arises behind the opercle, and the spines are flexible, increasing regularly to the last, which measures 1.5 in the length of the head; there is no apparent division between the spinous and the soft portion, and the rays regularly lengthen to the penultimate one, which is longer than the height of the body and one-half longer than the head: anal short, its base about one-seventh shorter than the head, the rays are a little shorter than the corresponding ones of the dorsal, the longest being one-third more than the head: the pectoral is sub-truncate, its fourth or longest ray being longer than the last dorsal spine, it extends nearly half the distance from its origin to the vent: the ventrals arise midway between the tip of the lower jaw and the vent: there is no trace of a spine, its office being taken by the first ray, which is simple, the third is the longest, measuring one-fourth more than the head; it extends to beneath the hinder dorsal spines: the caudal is slightly emarginate, its peduncle long and deep, its length from the dorsal rays being twice its depth or 1.1 in the head.

Scales.—The head is smooth and naked, with the exception of three rows of scales behind the eye, four rows on the upper edge of the opercle, and a small patch of ten scales in the temporal region, these are scarcely discernible in fresh specimens. The scales on the body are small and cycloid, the lateral line runs low, arising with a slight arch above the pectoral, thence it runs along the mid-line of the body to the tail. No scales on the fin rays.

Colours.—The whole body is dark olive green, the extreme lower edge excepted, which is white: a bronze band along the middle of the body, from the angle of the mouth to the base of the caudal: irregular blue wavy lines run longitudinally along the whole body. Lower portion of head with vivid violet spots

and short lines, lips tinged with pink, throat sky blue. Eye brown, a golden then a bright blue line encircling the pupil. Dorsal fin blood-red anteriorly gradually passing through a purple tint into the dark olive of the hinder rays: anal fin similar to the dorsal, the red colour confined to the margin, both fins with closely placed blue spots most pronounced basally: membrane of ventral green, the rays pink: pectoral bluish: caudal intense greenish-blue tipped with brown. All the bones, together with the teeth, including the pharangeals, are deep green.

Length.—520 mm.

The Butter Fish was not taken in the trawl, but was freely caught in the nets set in the kelp in various places round the Chatham Islands.

Family STROMATEIDÆ.

SERIOLELLA Guichenot, 1874.

Two species of the genus were taken, but, unfortunately, the individual records were lost. The three southern Stations were made northwards of Dunedin to the Canterbury Bight, and the three northern ones in Hawke Bay and the Bay of Plenty, the recorded depths being 9 to 105 fathoms.

Stations 22, 32, 39, 81, 83, 88.

SERIOLELLA BRAMA Günther.

WAREHOUS.

Plate L.

Neptomenus brama Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 390. Hector, Edible Fish. N.Z., 1872, p. 112, pl. v., fig. 31.

B. vii.; D. viii., 29; A. iii. 21; V. i. 5; P. 21; C. 14 + 8; L. lat. 88; L. tr. 17 + 34; Vert. 7 + 17 = 24.

Length of head 3.5, height of body 2.6, length of caudal 5.3 in the length; diameter of eye 4.1, interorbital space 2.4 and length of snout 3.2 in the head.

The upper and lower profiles of head and body form low even curves, the dorsal being the more convex: the eye lies wholly in the anterior half of the head and the nostrils are situated quite close to the end of the snout; the mouth is small, the maxilla not reaching the eye, it has a supplemental bone, the upper edge of which slips entirely under the preorbital; gill-rakers long, twenty-five on the first arch, of which seventeen are on the lower limb; opercles entire.

Teeth.—Extremely small in narrow bands in both jaws, none otherwise in the mouth.

Fins.—The dorsal spines are low and recumbent, the first being inserted well behind the edge of the opercle: the last spine is the longest, being adnate to the first ray which is simple, the second ray is the longest, nearly half the length of the head; the following rapidly diminish to the eighth, whence they are of nearly uniform height: the anal commences beneath the thirteenth dorsal ray and its hinder insertion is posterior to that of the dorsal: the pectoral is long and falcate, nearly as long as the body is deep, and extending to the first spine of the anal: the ventral is short, its spine equals the length of the snout and eye, its anterior insertion is midway between the hinder edge of the orbit and the anal; the caudal is large and deeply cleft, with a narrow peduncle, its least depth being equal to the snout.

Scales.—Cycloid and deciduous, those of the lateral line more adherent: scales are present on the cheeks and opercles, the upper part of the head is naked but without pores: the lateral line follows the contour of the back and extends to the base of the caudal.

Colours.—The head is brown above, yellowish on the sides and silvery beneath; eye with a bright golden mark before and another behind the pupil; the back, above the lateral line, is deep purple, and the sides are silvery with a pink tinge: a deep blue black blotch behind the head, crossing the lateral line but extending neither to the dorsal profile nor to the upper base of the pectoral: dorsal fin dark brown; pectoral and caudal with clouded edges, the latter reddish at the base.

Length.—553 mm.

In his revision of the fishes of the Family *Stromateidae*, Mr. C. T. Regan³⁴ admits five species of *Seriola*, and supplies a useful synopsis.

Since that time Mr. E. C. Starks³⁵ has described a new species taken at Callao, Peru, under the name *Neptomenus crassa*, and perhaps being unaware of or not admitting the generic identity with *Seriola* remarks:—"This is apparently the first record of the occurrence of this genus outside of Australian seas." The species should be compared with *S. violacea* Guichenot, from the coasts of Chili.

(24) Regan, Ann. Mag. Nat. Hist. (7) x. 1902, p. 127.

35) Starks, Proc. U.S. Nat. Mus. xxx. 1906, p. 784, fig. 8.

SERIOLELLA PUNCTATA Forster.

Plate LI.

Gasterosteus punctatus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 36.

Neptomenus bilineatus Hutton, T.N.Z.I. v., 1872, p. 261, pl. viii.

B. vii.; D. viii. 37; A. iii. 24; V. i. 5; P. 21; C. 14 + 8; L. lat. 118; L. tr. 22 + 28.

In addition to the fin formulæ this species differs from *S. brama* in being more elongate and by having a smaller eye. There is also a broad band of pores on each side of and a short distance from the dorsal fin; these pores are situated in a low ridge, which becomes more pronounced in the hinder portion of the body, but is lost beneath the upper caudal rays. The colouration is very similar to that of *S. brama*, the dark purple blotch at the origin of the lateral line being likewise present. Eye bright yellow with a dark mark above and another below the pupil. The largest example I have seen measures 204 mm. in length.

Placing the species under *Seriolella* Forster, with *S. bilineata* Hutton as a synonym Hutton³⁶ writes:—"I have no doubt but that this is the long lost fish of Forster. The mistake is due to the peculiar genus into which Forster put his fish, and from the absence in the colony of any copy of his drawing." In the "Index," Hutton³⁷ following Regan³⁸ reverts to his own name (*S. bilineata*).

Family CARANGIDÆ.

The following will serve to distinguish the three New Zealand species usually associated with Caranx:—

- a. A detached finlet behind the dorsal and anal fins. *Decapterus koheru*.
- aa. Dorsal and anal fins without detached finlets.
 - b. Lateral line with large scutes in its entire length . . . *Trachurus picturatus*.
 - bb. Lateral line with scutes in its posterior portion only . . . *Caranx platessa*.

(36) Hutton, T.N.Z.I. xxviii, 1896, p. 315.

(37) *id.* "Index Faunæ Novæ Zealandiæ" 1904, p. 44.

(38) Regan, Ann. Mag. Nat. Hist. (7) x. 1902, p. 128.

TRACHURUS Rafinesque. 1810.

TRACHURUS PICTURATUS Bowdich.

HORSE MACKEREL.

Seriola picturata Bowdich, Excursion to Madeira, 1825, p. 123, fig. 27.

Stations 72, 74, 80, 89.

D. viii. i. 29; A. ii. i. 26; V. i. 5; P. 21; C. 18 + 8; Sc. 44 + 41.

The specimens obtained agree with this species as diagnosed by Jordan and Evermann³⁹ exhibiting the following characters: The anterior scutes are low, not more than one-third the height of the posterior ones, and the curved portion of the lateral line is almost as long as the straight portion: the maxillary is relatively short, not reaching beyond the anterior margin of the orbit and the lining of the opercle is merely clouded with black. On the other hand, the depth of the body and the number of scutes is intermediate between the figures supplied for the two species. The large size of the specimens is another feature in common with *T. picturatus*, and the writers referred to have apparently identified New Zealand examples with this species.

It was trawled on four occasions, namely, twice in Palliser Bay, once north of Cape Turnagain, and once in the Bay of Plenty. The indicated depths range from 13-94 fathoms, but it cannot be certain that the fishes were taken on the bottom.

Length.—420 mm.

As it is well known, members of this family are particularly prone to harbour Isopodous parasites in their throats; writing of the Yellowtail of New South Wales, Ogilby⁴⁰ says:—"These fishes almost without exception suffer from being the host of an isopodous crustacean of the genus *Anilocra*, which lives in the throat, and thus obtains both sustenance and protection for itself; though it is common to take this commensal from the Sead with its developed ova attached we have never found more than one in a single fish."

The specimens from the New Zealand fishes have been kindly identified by Dr. Chilton as *Meinertia imbricata* Fabricius (*Ccratothoa banksii* Miers, Cat. N.Z. Crustacea). From one specimen I obtained eight individuals representing an adult and young in various stages.

(39) Jordan and Evermann, Bull. U.S. Nat. Mus., 47, i. 1896, p. 909.

(40) Ogilby, Edible Fishes N.S. Wales 1893, p. 79.

CARANX Lacépède, 1802.

CARANX PLATESSA Cuvier and Valenciennes.

TREVALLY.

Caranx platessa Cuvier and Valenciennes, Hist. Nat. Poiss. lx., 1833, p. 84.

Caranx georgianus id., p. 85. Richardson, Voy. Ereb. and Terr., 1848, p. 135, pl. lviii., fig. 1-3.

Stations 74, 81, 86, 87, 91, 92, 94, 95, 96.

D. viii. i., 26; A. ii. i., 21; V. i., 5; P. 20; C. 17 + 8; L. lat. 63 + 44 = 107.

This species was taken in Palliser Bay, off Cape Kidnappers. in Poverty Bay and in the Bay of Plenty. It was obtained between the extremes of 16 and 58 fathoms.

Length.—469 mm.

Family SCOMBRIDÆ.

SCOMBER Linnaeus, 1758.

SCOMBER PNEUMATOPHORUS De la Roche.

MACKEREL.

Scomber pneumatophorus De la Roche, Ann. Mus. Hist. Nat. xiii., 1809, pp. 315, 334. McCoy. Prod. Zool. Vict. i., 1879, pl. xxviii.

Station 72.

D. x. 11, vi.; A. i. 11, vi.; P. 18; V. i. 5; C. 20 + 10; L. lat. 225.

Length of head 4.0, height of body 4.3, length of caudal 9.4 in the length. Diameter of eye 3.5, interorbital space and length of snout 3.3 in the head.

Upper surface of snout and head flat without median groove. no ridge on the occiput; lower jaw slightly the longer, the maxilla, which is concealed beneath the preorbital, extends to just within the margin of the orbit; hinder edge directed obliquely backwards. Body not much compressed, its width 1.45 in its height.

Fins.—The distance between the tip of the snout and the origin of the first dorsal fin is 2.86, that between the origins of the two dorsals is 2.9, and the distance of the tip of the lower jaw to

the base of the ventrals is 3.2 in the total length, without caudal: the detached anal spine stands beneath the fourth dorsal ray: the pectoral is short, its length one-half that of the head, its upper insertion is level with the middle of the eye: the ventral is situated posterior to the insertion of the pectoral, and is slightly shorter than that fin: the caudal is deeply cleft, each lobe with a basal keel; the peduncle is very narrow as wide as deep. The lateral line is scarcely curved. Air bladder present.

Teeth.—Minute, present on the vomer and palatines, but not on the tongue.

Colours.—Upper surface bluish grey with dark blue lines and spots trending downwards and forwards to the lateral line, thence vertically or backwards; these markings extend to the midline of the body; the lower half of the body is silvery, with closely placed faint grey spots; the angle of the opercle is marked with radiating blue lines. The dorsal fins and finlets are dark blue, the ventrals and anal are colourless, while the pectoral is marked with black in its hinder third; a black axillary spot; outer and hinder edge of caudal narrowly bordered with black.

Length.—522 mm (= 20½ inches).

The only example trawled was obtained in Palliser Bay the depth being 13-14 fathoms.

The differences between the various supposed members of the genus *Scomber*, are so slight, and the difficulties of ascertaining the correct synonymy so great, that the identification of the New Zealand species with *S. australasicus* as distinct from *S. pneumatophorus*, is very doubtful; the latter has been regarded as a synonym of *S. colias*. In addition to other features, the example before me has a much shorter head and lower body than is described for the other forms; even more striking are the proportions rendered by Günther of (presumably) a specimen 26 inches long, attributed to *S. pneumatophorus*. It is noteworthy that the specimens described as having a long head and deep body are generally small. The question of the synonymy of the components of the genus *Scomber* is one which needs to be elucidated, but can only be accomplished by those who possess large collections and the necessary literature. Evermann and Kendall,⁴¹ who recently studied the claims of *S. colias* and *S. pneumatophorus*, arrived at the conclusion that the two are specifically distinct, the former being the Atlantic and the latter the Pacific species.

(41) Evermann and Kendall, P.U.S. Nat. Mus. xxxviii. 1910, p. 327.

Family TRICHIURIDÆ.

THYRSITES Cuvier, 1829.

THYRSITES ATUN Euphrasen.

BARRACOUTA.

Scomber atun Euphrasen, K. Vetensk. Acad. Nya Handl. xii., 1791, p. 315.

Thyrsites atun Cuv. and Val., Hist. Nat. Poiss. viii., 1831, p. 196. pl. cexix.

Stations 2, 6, 9, 11, 12, 13, 15, 17, 18, 19, 20, 25, 26, 28, 34, 35, 36, 38, 39, 42, 43, 44, 46, 47, 49, 50, 51, 58, 60, 63, 64, 65, 71, 81, 83, 85, 86, 88, 94.

This species, known from South African and Southern Australasian Seas is very common all round the coasts of New Zealand. Goode and Bean state that it is undoubtedly a deep-water form. This however is not so, or, at any rate, if found in really deep water, it is not confined to the depths. It was taken by the trawler from Stewart Island to the Bay of Plenty and at all depths from 10 to 105 fathoms.

Specimens netted at Station 20 had their stomachs crowded with the fish *Hemerocoetes acanthorhynchus*.

REXEA Waite, 1911.

Body moderately elongate, fusiform; mouth large with a single row of dagger-like teeth in each jaw: three enormous fangs towards the front of the upper jaw and two smaller ones in the lower jaw: teeth on palatines, none on the tongue. Two contiguous dorsal fins, the spinous portion in a sheath, two finlets above and below; pectorals small and low, ventrals small, each with four spines, caudal forked, peduncle without keel, scales small and smooth, lateral line single anteriorly but dividing forms an upper and lower branch.

This genus is near to *Promethichthys* Gill (?*Dicrotus* Günther) differing principally in the character of the ventral fins and in the configuration of the lateral line. It includes, as the type of the genus, the species described below, also *Thyrsites promethoides*⁴² Bleeker *T. micropus* McCoy⁴³ and possibly *T. (Promethichthys) bengalensis* Alcock.⁴⁴ (See discussion below).

(42) Bleeker, Act. Soc. Sc. Indo-Nederl. I. Amboina, p. 42 (*vide* Günth.).

(43) McCoy, Ann. Mag. Nat. Hist. (4) xi. 1873, p. 338.

(44) Alcock, Journ. Asiat. Soc. Bengal, lxiii. 1894, p. 117, pl. vi., fig. 1.

REXEA FURCIFERA Waite

KING FISH.

Rexea furcifera Waite, Proc. N.Z. Inst., 1911, p. 49.

Plate LII.

Stations 1, 2, 3, 4, 7, 11, 12, 13, 17, 18, 19, 32, 36, 39, 44, 81, 83, 88, 89, 90, 92, 95.

B. vii.; D. xviii. ii., 15, ii.; A. ii., 14, ii.; V. iv.; P. 14; C. 18 + 8.

Length of head 3.2, height of body 4.1, and length of caudal 6.9 in the length. Diameter of eye 4.8, interorbital space 4.6, and length of snout 2.4 in the head.

The head is sub-quadrangular in section, conical and acutely pointed, flat above, the edges rounded and a depression between the eyes; the latter are almost circular, and lie a trifle nearer the opercular margin than the tip of the snout.

The anterior nostril opens an eye diameter in front of the orbit and is directed forward from a horizontal tube, much as in the petrels (Tubinares), the posterior nostril lies half-way between it and the front margin of the eye: the length of the maxillary is half that of the head. its distal extremity is rounded and its greatest width is half the diameter of the eye, it extends to the anterior fifth of the orbit: the lower jaw markedly projects and its extremity forms and completes the anterior contour of the head: the tongue is slightly roughened: gill-rakers are replaced by teeth like those in the jaws; one, two or three being developed from the same base; of these bony bases there are ten on the upper and seventeen on the lower limb of the first arch. Pseudobranchiæ present.

Teeth.—The maxillary bears about twenty acute flattened distantly set teeth, largest in the middle: the vomer has three large dagger-like teeth, each with the tip of a similar one at its base, possibly destined to replace them: the palatine teeth are similar to the maxillary ones but smaller: the two large and widely separated teeth at the symphysis of the lower jaw are directed upwards and backwards and remain without the upper jaw when the mouth is closed: the lateral teeth are much larger than those in the maxilla.

Fins.—The first dorsal fin arises within the vertical of the opercular margin, the middle spines are longest, a third longer than the diameter of the eye: the fins are sub-continuous and

the longest rays are slightly higher than the middle spines; the anal is placed a little further back than the soft dorsal but is otherwise similar: the length of the pectoral is half that of the head; the ventrals are composed each of four weak spines, of which the first measures one-fourth the diameter of the eye: the caudal is forked and the peduncle is compressed, its depth less than the diameter of the eye.

Scales.—Cheeks opercles and body scaly, the scales small, the lateral line passes almost straight from above the opercle. near to the dorsal edge, to beneath the middle of the soft dorsal: beneath the base of the 5-6 dorsal spines it sends off a downward branch which descends suddenly to the mid line of the body, thence straight to beneath the origin of the soft dorsal; it then forms three waves, terminating in advance of the middle caudal rays.

Colours.—Iridescent blue above, silvery beneath; a deep black blotch on the dorsal between the i-iii spines, and the fin narrowly edged with black: soft dorsal, anal and caudal orange.

Length.—514 mm, the largest example preserved measures 711 mm.

Though taken generally between the extreme limits of the operations, this species was not obtained at Stations between Lyttelton and southward of Cape Kidnappers. It occurred at all depths between 9 and 105 fathoms. At Station 88 five young of the same species were taken from the stomach of one individual. Many of the Stations yielded specimens under twelve inches in length. Squid was generally found in the stomach.

As will be gathered from the introduction, I had regarded this fish as *Promethichthys prometheus*, probably because that species appears in the New Zealand list, but an examination for record purposes shows it to be quite different. It is allied to the three species before mentioned, and may indeed prove to be identical with one or more of them; it may not be distinct from *R. micropus*, but McCoy describes that form as having six dorsal and four anal finlets, and he had ample opportunities of verifying this feature, for he states that it is taken in great quantities from Tasmania to the Melbourne fish shops. The popular name is Tasmanian kingfish: and it may be noted that kingfish in the name applied to our form in the South Island. Passing by minor differences Alcock describes *R. bengalensis* as having a thick scaleless silvery skin; the scales of *R. furcifera* though small are quite apparent, but one is tempted to ask if the nudity of the Indian specimens may not be due to immaturity, the examples, of only $5\frac{1}{4}$ inches in length being in all probability, very young. I am not aware of the condition

of the skin in *R. promethoides*, for I have only Günther's epitomised description for guidance, and he does not mention the feature, which indeed may not be referred to by Bleeker. Supposing that the character has not been overlooked in regard to the ventrals fins, all the previously described forms differ from our specimens in the smaller number of spines or rays. I have chronicled the four components as spines, for they are all stiff, simple and do not exhibit any jointed feature. The comparative measurements given in the different descriptions are taken in such varied manner as to be useless for diagnostic purposes; I therefore supply the above description and figure for the use of those who may have access to further material.

The following table shows the comparatively close agreement in the radial formulæ.

	Dorsal.	Anal.	Ventral.
<i>R. promethoides</i> .	xviii. ii. 15. ii.	ii. 14. ii.	i.
<i>R. micropus</i>	xvii. iv. 12. vi.	ii. 11. iv.	ii.
<i>R. bengalensis</i>	xviii. ii. 13-14. ii.	ii. 11-12. ii.	i.
<i>R. furcifera</i>	xviii. ii. 15. ii.	ii. 14. ii	iv.

LEPIDOPUS Gouan, 1770.

LEPIDOPUS CAUDATUS Euphrasen.

FROST FISH.

Trichiurus caudatus Euphrasen, K. Vetensk. Acad. Nya. Handl. ix., 1788, p. 52.

Station 83.

This species was but once taken in the trawl, four small examples being netted in Hawke Bay, at a depth of 68-78 fathoms. The specimens range from 320 to 415 mm. in length, and are of the usual silver-grey colour, but the lateral line lies in a rust-coloured band, and there are similar narrower and fainter bands above and below it.

The name frost fish is applied in reference to its well known habit of going ashore in the winter months. I once witnessed such an occurrence. Coaching along the shores of the Bay of Plenty in July, 1908, I witnessed the fishes in the surf; they seemed to be writhing helplessly, and were carried further and further inshore by each succeeding wave until finally stranded on the beach. Specimens were picked up in different parts of the beach for a distance of forty miles, and on arriving at my destination, I learned that other travellers had similar experiences

in different parts of the extensive Bay. Even before they were finally cast ashore, the fishes were more or less mutilated by gulls, most of them having their eyes picked out. Many theories have been advanced to account for the peculiar behaviour of the fishes. I believe that von Lendenfeld⁴⁵ considers that they approach the surface for spawning purposes, but not having access to his paper I am unaware if this is merely a theory or a proven fact.

Family LEPTOSCOPIDÆ.

CRAPATALUS Günther, 1861.

CRAPATALUS NOVÆ-ZELANDIÆ Günther.

Crapatalus novae zelandiae Günther, Ann. Mag. Nat. Hist. (3) vii., 1861, p. 87, pl. x.

Leptoscopus angusticeps Hutton, T.N.Z.I. vi., 1874, p. 106, pl. xix.

Station 17.

B. vi.; D. 33; A. 39; P. 21; V. i. 5; C. 10 + 4; L. lat. 50; L. tr. 16 + 18.

Length of head 4.1, height of body 8.8, length of caudal 7.6 in the length; diameter of eye 9.1, interorbital space 6.2, length of snout 4.5 in the head.

The opercles mark the widest part of the fish, and the head tapers to the snout, which is obtusely rounded; the top of the head is quite flat with a ridge on the inner side of each eye forking behind: the mouth is oblique, the lower jaw being much the longer with a prominent chin; both upper and lower lips bear long fringes. The body is rounded passing into the long and compressed tail.

Teeth.—The teeth are depressible, and arranged in bands; they are uniformly short in the mandible, but the median teeth of the premaxilla are twice as long as the others.

Fins.—The dorsal fin arises at a point one-third the distance to the end of the caudal rays; it is low, the median rays being longest and nearly one-fourth the length of the head; the anal arises close behind the vent, whose distance from the tip of the snout is one-fourth the total length (caudal included), and extends closer to the caudal than does the dorsal: its rays are longer and thicker than those of the dorsal, and all are undivided; the pectoral extends to the fourth dorsal ray, and its

(45) Lendenfeld, Zool. Anzeiger, 1883, p. 559.

length is 1.3 in the head; the eight upper rays are divided, the lower ones are simple; these latter rapidly decrease in length, forming a lower concave margin; the ventrals are very short, not reaching the vent by an eye diameter, and are contained thrice in the length of the head; the caudal is truncated and the depth of its peduncle equals the interorbital space.

Scales.—The head is entirely naked as is also the space behind the pectorals and between the ventrals; the scales are small and deeply imbedded on the occiput, but they become larger, and imbricate, those on the tail being largest. The lateral line arises above the opercle and gradually descends to the mid line, thence running straight to the caudal: its scales are very large and leaf-shaped with a central ridge, the line is therefore extremely conspicuous.

Colours.—Except quite anteriorly the lateral line sharply divides the colouration, that above being brown, each scale with a darker dot, the upper part of the head is brown dotted, the entire lower parts are white: a row of about five brown spots is found on the front of each ray of the dorsal, but the other fins are without markings.

Length.—378 mm.

The only specimen obtained was taken off Otago Heads, in 55-102 fathoms. While *L. robsoni* Hector,⁴⁶ and *L. canis* Arthur,⁴⁷ are without doubt synonyms of *L. angusticeps*, and with which my specimen quite agrees, this latter species does not conform to either Günther's description or figure, which, however, are not in themselves entirely consistent: thus the body is illustrated as far deeper than described. In my specimen the ventrals do not reach the anal by fully half their length, and the shortness of these fins is indicated by Hutton's figure. Günther describes the ventrals as extending to the fourth anal ray: he also describes and figures the interorbital space as much narrower than found by Hutton and myself. The transverse rows of scales are rendered as 7/7, but they are much more numerous in my specimen, counted from the origin of the dorsal fin. It is possible that there are two allied species in our waters, but for the present I follow authors in regarding the genus as monotypic, indicating the essential features of the Otago specimen as above.

(46) Hector, T.N.Z.I. vii. 1875, p. 248.

(47) Arthur, *ib.* xvii. 1885, p. 165.

Family URANOSCOPIDÆ.

The three genera of this family, known from New Zealand, may be recognised by the following characters:—

- a. A strong forwardly directed spine in front of each ventral fin *Kathetostoma*.
- aa. No forwardly directed spines in front of the ventral fins.
 - b. Lower jaw normal *Geniagnus*.
 - bb. Lower jaw with a pair of dilated processes which meet in front of the chin *Gnathagnus*.

KATHETOSTOMA Günther, 1860.

KATHETOSTOMA GIGANTEUM Haast.

Kathetostoma giganteum Haast, T.N.Z.I. v., 1873, p. 274, pl. xvi., fig. 2.

Stations 39, 47, 48, 49, 50, 67, 68, 83, 91.

D. 18; A. 18; V. i., 5; P. 21; C. 11.

The head is measured from the chin to the opercular margin, and its length is one-fourth the total, depth of body 5.2 and length of caudal 4.3 in the length. Diameter of eye 5.4, interorbital space 2.7 and length of snout 6.1 in the head.

The head is very broad and flat, its breadth greater than its length, or about one-third the total: the bony armature consists generally of raised ridges which radiate from several centres, the most conspicuous is a pair placed at the inner hinder margin of the eyes and another pair on the occiput; the former embraces the inner and hinder edges of the eyes, while the hinder rays of the occipital pair are truncated and form a straight line; another plate is placed before the eye, and there are less regular patches in a series from below the eye to the preopercle and opercle; a final series occurs between the eye and the humeral spine; the latter is very strong, and is curved outwards and backwards. Mouth large and vertical, lower lip incised in the middle to receive a protuberance of the upper one: maxilla broad, its distal end wider than the eye; chin with numerous transverse ridges which posteriorly become distinct folds with fringed edges: five blunt spines on the lower preopercular edge, the first two lying below the maxilla; two strong spines in front of the ventral fins, directed forwards.

Teeth.—There are several rows of sharp teeth in the jaws and a closely plicated membrane behind them.

Fins.—The dorsal fin commences midway between the edge of the upper jaw and the base of the caudal, its longest rays are twice the length of the eye; the anal has a slightly more anterior insertion and is continued further back, its posterior rays are longer than the corresponding ones of the dorsal and attain nearly to the base of the caudal rays: the pectorals are connected to the body by membrane beneath the humeral spine, and are of great size, reaching to beneath the base of the 5th dorsal spine, the lower nine rays are thickened, and are successively shortened; the ventrals are separate, disposed horizontally and quite flat, the last or longest ray being 1.6 in the head; the caudal is rounded.

Scales.—Body scaleless. The lateral line arises above the humeral spine and passes along the upper edge near the dorsal fin, but suddenly drops on the caudal peduncle to the middle of the tail, and is continued nearly to the end of the caudal rays.

Colours.—Head and body above the lateral line, greyish brown mottled below, the lateral line is without markings, and the appearance of longitudinal stripes is thus produced: lower surfaces colourless: dorsal fin mottled, pectorals and caudal dark grey with white margins.

Length.—426 mm., the largest specimen preserved measures 555 mm.

Taken from the Canterbury Bight northward to the Bay of Plenty, at depths between 28 and 78 fathoms.

Hitherto *Kathetostoma laevis* Bloch and Schneider, has been regarded as a New Zealand species, and *K. giganteum* Haast placed as a synonym. Our specimens are, however, distinct, and I am obliged to Mr. A. R. McCulloch for comparing specimens with Australian examples: he mentions that the bony ridges on the head are not broken up into tubercles as in *K. giganteum*, and that the antero-posterior dimensions of the bony area is greater than the interorbital space, while it is equal to it in our form; the fringes between the chin and the ventral spines are neither so numerous nor so well defined in *K. laevis*, and in this species the lateral line is much better defined: lastly, the colour pattern of *K. laevis* tends to form transverse bars, while in *K. giganteum* they are longitudinal. The New Zealand species grows to an enormous size, the type being 740 mm. in length. Gill placed this species as a synonym of *Geniagnus maculatus*, but I find it to be a true *Kathetostoma*, allied to

K. laeve, but distinct. In large specimens the markings become ill-defined resulting in a general mottling, but in young specimens the ornamentation is very striking. The upper half of the body is warm brown, and there is a median white line in which the dorsal fin stands, and another on each side occupied by the lateral lines, the sides are ornamented with large white spots.

An examination of the type specimen shows that the formula of the fin rays has been incorrectly rendered in the description, my count being as below.

D. 18; A. 17 or 18; v. i. 5; P. 22; C. 11.

GENIAGNUS Gill, 1861.

GENIAGNUS MACULATUS Forster.

Uranoscopus maculata Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 49.

Anema monopterygium Günther, Cat. Fish. Brit. Mus. ii., 1860, p. 230.

Kathetostoma monopterygium Hutton, Cat. N.Z. Fish., 1872, p. 23.

Synnema monopterygium Haast, T.N.Z.I. v., 1873, p. 274

Genyagnus maculatus Gill, Mem. Nat. Acad. Sci. vi., 1893, p. 118.

Stations 1, 2, 13, 16, 23, 30, 31, 35, 39, 47.

This species appears to be a southern form, having been trawled from Stewart Island, northward to Lyttelton.

It may readily be mistaken for *Kathetostoma*, its general form, colour, and markings being very similar. The small eyes, inconspicuous humeral spine and the absence of any spines in front of the ventral fins are sufficiently striking, the bony ornamentation on the top of the head also is quite different; it is formed of compact masses, and there is a hinder median boss not represented in *Kathetostoma*, in which also the rugosities are much more open. The upper half of the body is brown with large white spots, which do not form lines as in *Kathetostoma*.

GNATHAGNUS Gill, 1861.

GNATHAGNUS INNOTABILIS Waite.

Gnathagnus innotabilis Waite, Rec. Aust. Mus. v., 1904, p. 238, pl. xxvi., fig. 1.

Stations 89, 91, 92, 94, 95.

All the specimens obtained were taken in the Bay of Plenty, where nine, practically continuous, hauls were made, and the

species was represented at five of them. The bottom was sand and mud, and the registered depths 25 to 94 fathoms.

The largest example previously known was 152 mm. in length, but specimens taken by the trawler show that it attains a considerable size, up to at least 560 mm.

Three specimens were originally taken off Narrabeen, New South Wales, and those now recorded constitute a record for New Zealand, the genus not being previously known from our waters.

Family PARAPERCIDÆ.

PARAPERCIS Bleeker.

PARAPERCIS COLIAS Forster.

BLUE COD.

Gadus colias Forster, in Bloch and Schneider, Syst. Ichth. 1801, p. 54.

Stations 23, 25, 49.

As this species inhabits the vicinity of rocks it is not usually taken in the trawl, and at two of the three recorded Stations the net was fouled with rocks. The Blue Cod was freely taken at the Chatham Islands on hand lines, the specimens being of large size and excellent market fish, a matter I have previously referred to (pp. 53 and 56).

PARAPERCIS GILLIESII Hutton.

Plate LIII.

Percis gilliesii Hutton, Ann. Mag. Nat. Hist. (5) iii., 1879, p. 53.

Station 89.

B. vi.; D. v. 21; A. 17; V. i. 5; P. 20; C. 14 + 6; L. lat. 62; L. tr. 7 + 20.

Length of head 3.7, height of body 4.8, length of caudal 4.5 in the total; diameter of eye 2.6, interorbital space 9.0, and length of snout 3.0 in that of the head.

The upper part of the head and snout are declivous, while the under part is flat, the large eyes are quite near to each other and cut the upper profile: snout acute, mouth small, cleft horizontal, with the lower jaw slightly longer than the upper: the maxilla extends to beneath the anterior third of the eye, edge of preopercle smooth, a spine on the opercle.

Teeth.—A broad band of villiform teeth, and an outer pointed series in a single row in each jaw.

Fins.—The dorsal commences above the root of the pectoral, its fifth spine is the longest, equal to the diameter of the eye; the first and last rays are shorter than the others, which are subequal, and one-half longer than the eye; the anal is lower and arises beneath the fifth dorsal ray; the pectoral and ventral are of equal length, one-sixth shorter than the head, the latter reaches the second anal ray; the upper lobe of the caudal is pointed, the lower lobe rounded, and the depth of its peduncle is nearly equal to the diameter of the eye.

Scales.—The snout and lower parts of the head are naked, but the hinder part of the cheeks, opercles, and the whole of the body, are covered with ciliate scales of moderate size; the lateral line is slightly bowed over the pectoral and extends to the base of the caudal.

Colours.—Generally sandy with dark brown markings, two lines along the body, the upper of which crosses the lateral line at the middle of its length, a number of bands pass from the upper brown line across the back, they are generally in pairs, one across the occiput, one at the first dorsal spine and another at the first ray, three more beneath the rays and a last one on the caudal peduncle; the base of the dorsal has a brown mark where crossed by each band and an intramarginal line of the same colour, the other fins are colourless.

Length.—164 mm.

One specimen only was obtained, it was taken in the Bay of Plenty in 66-94 fathoms, and judging by the large size of the eye it is an inhabitant of moderately deep water.

This specimen is possibly only the third known, the type having been taken near Dunedin, while another is in the collection of this Museum.

Family TRICHONOTIDÆ.

HEMEROCETES Cuvier and Valenciennes, 1837.

HEMEROCETES ACANTHORHYNCHUS Forster.

Plate LIV., fig. 1.

Callionymus acanthorhynchus Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 41.

Hemerocoetes acanthorhynchus Richardson, Voy. "Ereb. and Terr.," Fishes, 1848. p. 123, pl. liv., figs. 7-12.

Stations 5, 20, 48. 50.

B. vii.; D. 42; A. 40; V. i. 5; P. 18; C. 8 + 6; L. lat. 48; L. tr. 4 + 7.

Length of head 4.2, height of body 11.2, and length of caudal 6.7 in the total: diameter of eye and length of snout 3.3 in the head.

The interorbital space is so narrow that the orbits all but touch each other, the nostrils of each side are widely separated and are placed close in front of the eyes, the maxilla extends to beneath the middle of the eye, and each preorbital carries a spine directed over the premaxilla; gill membranes very wide, not attached to the isthmus, gill-rakers short and blunt, fifteen on the first arch, of which two are on the lower limb.

Teeth.—Villiform teeth in bands in the jaws and on widely separated patches on the expanded ends of the vomer.

Fins.—The dorsal commences close behind the base of the pectoral, its rays are of uniform height, the few anterior and posterior ones excepted; their length is equal to the height of the body: the length of the anal is twice the distance of its origin from the end of the snout, it arises below the 5-6 rays of the dorsal and is continued posterior to that fin, its rays are one-fourth shorter than those of the dorsal; pectoral rounded 1.6 in the head; the ventral just reaches the vent, and it is a little shorter than the snout and eye together; the caudal is rounded, but the second and third upper principal rays are elongate, the third being the longest, and one-half longer than the fourth: the peduncle is low, one-half the diameter of the eye.

Scales.—Snout naked, upper part of head, cheeks and opercles with scales a little smaller than those on the body, which are large, cycloid and carry small auxiliary scalelets at their bases; the scales of the lateral line are crenulate but not spinous. The lateral line is slightly depressed over the pectoral, otherwise runs straight along the middle of the body.

Colours.—All the colours have faded in the preservative, but during life they were very striking, the head and body being marked with blue lines and some red spots on the fins; subvertical lines on the cheek, and two lines on the dorsal may still be traced. I have, unfortunately, lost my drawings made on board the trawler.

Length.—194 mm.

This species was taken at the southern Stations, between Foveaux Strait northward to Pegasus Bay in 20 to 67 fathoms, and was also found in the stomachs of Barracoutas (*Thyrssites atun*) at Station 20.

With the exception of a slightly larger eye and a difference in the caudal rays, the specimens agree well with Richardson's figure; this writer mentions that the tail in his specimen was not perfect, and states that Forster drew the tail as being lunate at the end, and that Dr. Dieffenbach described the fin as being truncated with an elongation of the upper angle.

HEMEROCETES MICROPS sp. nov.

Plate LIV., fig. 2.

The specimens below described were not taken by the trawler, nor within the sphere of its operations; they were caught by myself on a hand line in the various Sounds on the south-west coast, and present several differences from what I have considered or have chosen to consider as typical of *H. acanthorhynchus*: the principal features in which the specimens differ may be expressed as follows:—

D. 40; A. 39.

Length of head 3.7, height of body 10.4, and length of caudal 5.6 in the total: diameter of eye 4.5 and length of snout 2.5 in the head.

Compared with *H. acanthorhynchus*, the head is larger, while the eye is very much smaller, both vertically and horizontally, so that the interorbital space is wider and the snout much longer; in the older species the eye and the snout are of almost equal length, but in *H. microps* the eye is but half the length of the snout; there is a prominent knob above the tip of the upper jaw.

Fins.—The vertical fins are very much higher than in the type species, the dorsal being more than a third higher than the body: the lunate caudal, when compared with Richardson's figure, would also appear to be different, but the shape is really determined by the degree to which the outer rays are produced, a feature which may depend upon age, sex or other condition.

Colours.—The once brilliant colouration has quite disappeared in preservative, the general disposition of the markings alone remaining. The upper part of the head and the body above the lateral line are brown, the underparts are colourless; a blue line from below the preorbital spine, passes backwards beneath the eye, there are some oblique bars on the cheeks and opercles: and seven dark brown bars across the upper half of the back, the first being in advance of the dorsal fin and the last behind it on the caudal peduncle: all the fins are smoky; the dorsal has three darker horizontal lines.

Length.—217 mm.

The brilliant colouration and striking markings of this fish excited the interest of all who saw it alive, but not recognising it as different from the specimens previously trawled, and of which I had made careful colour sketches—since lost—I did not take note of its characters.

Presuming that the specimen described and figured by Richardson is co-specific with Forster's examples, I have given a

new name to the smaller eyed, longer snouted, and longer rayed form taken on the west coast, and have figured specimens of each.

Family BLENNIIDÆ.

TRIPTERYGION Risso, 1826.

TRIPTERYGION VARIUM Forster.

Blennius varius Forster, in Bloch and Schneider, Syst. Ichth., 1801, p. 178.

Station 48.

Living examples were trawled in Pegasus Bay in 44 to 46 fathoms, and at the same time specimens were taken from the stomach of a Trumpeter (*Latris lineatus*). I have recently described specimens taken at the Auckland Islands.⁴⁸

Family OPHIDIIDÆ.

GENYPTERUS Philippi, 1857.

GENYPTERUS BLACODES Bloch and Schneider.

LING.

Ophidium blacodes Bloch and Schneider, Syst. Ichth., 1801, p. 484.

Stations 1, 2, 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 21, 22, 26, 27, 29, 31, 32, 34, 35, 36, 38, 39, 40, 41, 42, 43, 44, 45, 47, 48, 49, 50, 52, 53, 54, 57, 61, 62, 65, 66, 67, 77, 78, 86.

Represented in almost every haul from Stewart Island to Gisborne and at depths from 9 to 183 fathoms, this species was more plentifully taken at the southern Stations. At Half-moon Bay, Stewart Island, the Ling was commonly seen swimming round the piles of the jetty in four feet of water: it was also represented in the hauls made at the Chatham Islands. I have previously (p. 54) referred to the extreme buoyancy of this fish when drawn to the surface, remarking that when the air bladder and tissues are distended it resembles an elongated barrel, and comparatively few are required to float the net and its contents. Cephalopods, crustaceans, eels and other fishes were commonly removed from the stomachs, while all the examples netted at Station 7 in 43 fathoms had the intestinal tract crowded with the crustacean *Munida gregaria*.

(48) Waite, "Subantarctic Islands of N.Z." 1909, p. 597.

Family SCORPÆNIDÆ.

SCORPÆNA Linnaeus, 1758.

SCORPÆNA PERCOIDES Richardson.

SEA PERCH.

Sebastes percoides Richardson, Ann. Mag. Nat. Hist. ix., 1842.
p. 384.

Scorpaena barathri Hector, T.N.Z.I. vii., 1875, p. 245.

Stations 18, 19, 22, 23, 24, 25, 26, 30, 36, 38, 46, 49, 71, 83, 84, 88,
89.

This common species was freely taken, the depths ranging from 13 to 105 fathoms. Günther states that it descends to 400 fathoms.

In 1887 *S. barathri* was pronounced by Günther⁴⁹ to be synonymous with this species. Being possibly unaware of this, Gill⁵⁰ catalogued it as *Sebastapistes barathri*, and it therefore appeared in Hutton's "Index" and consequently in my "Basic list" also.

Specimens taken on hand lines at Pitt Island, one of the Chatham Islands group, measure 398 mm. in length.

In common with many other Sebastoid fishes, this species is viviparus, a fact first made known to me by Mr. Anderton. The young are very small, but are produced in large numbers.

CONGIOPODUS Perry, 1871.

CONGIOPODUS LEUCOPÆCILUS Richardson.

PIG FISH.

Agriopus leucopaecilus Richardson, Voy. Ereb. and Terr., 1846,
p. 60, pl. xxxvii., fig. 4, 5.

Congiopodus leucopocilus Gill, Mem. Nat. Acad. Sci. vi., 1893,
p. 118.

Stations 16, 20, 21, 22, 23, 24, 25, 26, 29, 30, 31, 33, 34, 36,
46, 49, 50, 51.

The localities at which this species was taken are all southern ones, no examples being netted north of Pegasus Bay: it was found to be extremely common where it occurred, and was obtained at depths between 13 and 50 fathoms.

The South American species *C. peruvianus* Cuvier and Valenciennes appears to have been first recorded for New

(49) Günther, Chall. Rep. xxii. 1887, p. 17.

(50) Gill, Mem. Nat. Acad. Sci. vi. 1893, p. 117.

Zealand by Hutton,⁵¹ who writes: "Distinguished by having a small spine before each orbit," which indeed is the only expressed difference rendered in Günther's work. I have compared the specimens used by Hutton with the fine series now at my command, and I find them to be identical. It may be noted that small examples possess the preorbital spines, whereas larger ones do not, the spines are therefore characteristic of immaturity. I am not in a position to decide if *C. leucopaecilus* is distinct from *C. peruvianus*; if not the latter name should be employed. It is certain, however, that we know but one species from New Zealand.

The Pigfish was found to be feeding largely upon a minute hermit crab, which Dr. Chilton identifies as *Eupagurus stewarti* Filhol; the crustacean was not extracted by the fish, but the shell of the mollusc or the small mass of calcareous polyzoon in which the crab resided was swallowed whole, and the crustacean was doubtless dissolved out by the juices of the fish's stomach.

I may here refer to another extremely doubtful New Zealand member of the family. *Perca cottoides* Linn. (= *Cottapistus cottoides*) was entered as a member of our fauna on the evidence of a specimen in the Haslar collection received at the British Museum, but in giving the range of the genus (*Prosopodasys*) Günther placed New Zealand within brackets evidently to express doubt. The species, however, found a place in the New Zealand lists, but in 1890, Hutton⁵² marked the entry with a ?, and, in a working copy which he used, I find the species scored out and *Agriopus peruvianus* substituted. As far as I am aware, no further specimen has been identified from New Zealand, and I think that the species may be placed with those which remain to be rediscovered.

Family COTTIDÆ.

NEOPHRYNICHTHYS Günther, 1876.

NEOPHRYNICHTHYS LATUS Hutton.

TOADFISH.

Psychrolutes latus Hutton, T.N.Z.I. viii., 1876, p. 214.

Neophrynichthys latus Günther, Ann. Mag. Nat. Hist. (4) xvii., 1876, p. 396, (not P.Z.S., 1881, p. 20, pl. i.) Gill, P.U.S. Nat. Mus. xi., 1888, p. 327, pl. xli.

Stations 5, 28, 31, 32, 40, 43, 44, 50.

This appears to be a southern species, not being taken northward of Pegasus Bay, though obtained from our most southerly

(51) Hutton, T.N.Z.I. xxviii. 1896, p. 314.

(52) *id.*, *ib.* xxii. 1890, p. 277.

Station; it shows considerable vertical range, having been trawled between 9 and 183 fathoms.

This fish formed the principal subject of the paper by Dr. Gill, above listed, but having but a single specimen, the author was unable to sacrifice it to ascertain its anatomical structure. He writes:—"We may hope that perhaps Professor Parker, to whom we are indebted for excellent memoirs on the anatomy of several fishes of his adopted home, may give himself, or depute a student to give us, some details as to the anatomy of a fish which does not appear to be excessively rare in New Zealand." I was particularly unfortunate in my selection of a specimen for anatomical examination, for choosing one which was unsatisfactory as regards its exterior I found that the skull was broken to pieces and so crushed as to render it impossible to ascertain the original condition of the bones. Moreover the specimen was preserved in formaline, a medium which so hardens the tissues as to make dissection from bones which appear to be semi-cartilaginous, a rather difficult matter under the best conditions. I possess only one example preserved in spirits, and this I have sent to Dr. Gill with the request that he will examine it, so that we may have the benefit of his wide experience in all matters connected with the anatomy of fishes.

The following are the few notes revealed by an examination of the imperfect specimen above referred to:—

B. vii.; D. xii., 15; A. 14; V. i. 3; P. 25; C. 10 + 8.

The vertebræ number 33, there are four gills, no slit behind the fourth, gill-rakers ten, eight being on the lower limb of the first arch, they are very small and widely spaced, the upper pharyngeal teeth are two rounded masses. the lower ones are smaller and flat.

Though known to attain a length of 407 mm. (= 16 inches). all the examples taken in the trawl are much smaller, and specimens 188 mm. in length have the ova fully developed.

Family TRIGLIDÆ.

The three genera of Gurnards known in New Zealand waters may be thus identified:—

- | | |
|--|-------------------------|
| a. Scales very small. | |
| b. Spiny scutes at the bases of both dorsal fins. | <i>Chelidorichthys.</i> |
| bb. Flat scutes at base of first dorsal only | <i>Pterygotrigla.</i> |
| aa. Scales large, lateral line with 75 or fewer scales | <i>Lepidotrigla.</i> |

CHELIDONICHTHYS Kaup, 1873.

CHELIDONICHTHYS KUMU Lesson and Garnot.

RED GURNARD.

Trigla kumu Lesson and Garnot, Voy. Coquille, Poiss, 1826, p. 214, pl. xix.

Chelidonichthys kumu Jord. and Evern., Rep. U.S. Fish. Comm., 1896, p. 488.

Stations 25, 31, 34, 39, 42, 43, 44, 51, 53, 54, 61, 62, 64, 65, 67, 69, 70, 72, 73, 74, 76, 77, 78, 80, 81, 85, 86, 87, 90, 92, 93, 94, 95.

This common species was first encountered off Oamaru and was thence taken generally throughout the remainder of the cruise, the depths ranging from 10 to 105 fathoms.

PTERYGOTRIGLA Waite, 1899.

PTERYGOTRIGLA PICTA Günther.

SPOTTED GURNARD.

Plate LV.

Trigla picta Günther, Chall. Report, Shore Fishes, 1880, p. 24, pl. xiii., fig. A.

Pterygotrigla andertoni Waite, Proc. N.Z. Inst., 1910, p. 26.

D. vii.-viii. 12; A. i. 11; V. i. 5; P. 12 + 3; C. 11 + 8; Sc. 117; Vert. 10 + 16 = 26.

Length of head (exclusive of spines) 2.9, height of body 3.8, length of caudal 4.8 in the total; diameter of eye 3.2, interorbital space 3.0, length of snout 2.1 in the head.

Profile of snout very declivous, supraorbital edge most prominent, rising far above the contour of the head, producing a concave interorbital area; the maxillary reaches to below the anterior margin of the orbit: a single flat rostral spine on each side, a sharp spine on the temporal and another on the opercle, both directed backwards, a smaller one at the angle of the preopercle, a deep notch below it; a large spine on the supraclavicle directed upwards and backwards. Gill-rakers short and stout, fifteen on the first arch.

Teeth.—Teeth in narrow bands in the jaws, divided on the mid line, and on the head of the vomer; none on the palatines.

Fins.—The dorsal spines are strong and sharp with acute edges, the first, which stands wholly behind the head, slightly

exceeds the orbit in length, the third spine is the longest, but does not extend as far as the fourth or fifth when depressed; its length is nearly twice that of the orbit: the two first spines stand on a slight eminence, the others in a depression: the base of the soft dorsal is one half longer than that of the first, and its fifth or longest ray is shorter than the second spine: the anal arises in advance, and terminates posterior to the soft dorsal and its corresponding rays are lower; the pectoral is very long, reaching to below the middle of the base of the second dorsal; of the three detached rays the upper one reaches to the base of the first anal ray, or to the tip of the ventral, which fin reaches the base of the first anal ray; caudal fin deeply cleft with pointed lobes, the outer margins of which are quite straight, the peduncle is very low, its depth being one-half the diameter of the orbit, its thickness is but slightly less; the rays leave it at a very marked angle.

Armour.—The striæ on the head plates arise from certain centres and extend radially, they are especially rugose on the upper plates; the occipital plate is deeply incised, the temporal spines forming its outer border; the flattened area whence the spinous dorsal arises bears eleven rugose plates, the first is large, crescentic with straight lateral sutures, extending across, in front of the first spine; the others become successively smaller, the last pair being at the base of the sixth spine.

Scales.—Scales very small, deeply imbedded, lateral line well marked, anterior portion of body, below the dorsal plates and including the lower surface, naked.

Colours.—General colour pink, yellow above and white beneath; bony plates ochraceous; fins yellow. The whole of the upper half of the head and body with black spots of different sizes and irregularly arranged; similar spots on the dorsals and caudal fins, those on the upper edge of the caudal are elongate and form a margin; the inner side of the pectoral is brown with seven black bars, these show through to the outer side, but no markings are visible when the fin is closed, the only spots then seen are those on the first ray and some smaller ones at the base of the fin, the lowest ray is without colour or marks, a few spots on the detached rays: the outer surfaces of the first three rays bear three rows of large spots; the fin is broadly margined with white.

Length.—294 mm.

This species, represented by several specimens, was taken in the Bay of Plenty after I left the trawler, and was sent to me by Mr. Thomas Anderton, Curator of the Portobello Marine Fish Hatchery.

It differs from *P. hemisticta* in comparative proportions also in colour markings, as ascertained from the description by Jordan and Starks.⁵³ The maxillary is much shorter, not extending beyond the anterior margin of the eye; there are more plates at the base of the first dorsal fin and the rays are relatively higher: both ventral and pectoral fins are longer and the detached rays of the pectoral (which may be called Chiropods) are relatively shorter.

In regard to colour, the large black spot on the dorsal fin of the Japanese species is replaced with small scattered spots, not dissimilar from those on the body, the dorsal rays bear three rows of spots and the ventrals and chiropods are also spotted. Fresh specimens of *P. hemisticta* may exhibit markings on these fins also, as the one described was "apparently faded." Judging from our examples, however, I shall be quite prepared to hear that the colouration of the specimen was not far from normal. It is unlikely that there is any agreement in the colour of the pectoral in the two species; in *P. hemisticta* the markings are in the form of two rows of milk white spots, while in the New Zealand form there are seven black bars.

The name *P. andertoni* was published, the above description written, and the accompanying plate prepared before I discovered that the species was in all probability identical with *Trigla picta*, described from Juan Fernandez.

Having communicated these facts to Mr. A. R. McCulloch, he informs me that the same species was trawled by the "Endeavour" in Southern Australia; the three known habitats of this handsome fish are therefore in approximately the same latitude.

The genus *Otokime*, of which *O. hemisticta* is the type, is a synonym of *Pterygotrigla*.

LEPIDOTRIGLA Günther, 1860.

- | | |
|--|-----------------------|
| a. Pectoral long, more than one-third the total length, a black mark on the first dorsal | <i>vanessa</i> . |
| aa. Pectoral shorter, less than one-third the total length, dorsal without markings | <i>brachyoptera</i> . |

Of the two described New Zealand species, one only was obtained.

(53) Jordan and Starks, P.U.S. Nat. Mus. xxxii. 1907, p. 132.

LEPIDOTRIGLA BRACHYOPTERA Hutton.

GURNARD.

Lepidotrigla brachyoptera Hutton, Cat. Fish. N.Z., 1872, p. 27,
and T.N.Z.I v., 1873, pl. xv., fig. 41.

Stations 21, 26, 30, 36, 39, 50, 67, 74, 75, 83, 84, 88, 89, 90.

B. vii; D. viii. 16; A. 16; V. i. 5; P. 11 + 3; C. 12 + 20;
L. lat. 64.

Length of head 2.7, height of body 4.0, and length of caudal
4.1 in the total; diameter of eye 3.0, interorbital space 3.7, and
length of snout 2.7 in that of the head.

Snout emarginate, the lateral prominences rounded with about
six denticles, interorbital space flat in the middle, but the supra-
orbitals are much raised; supraocular and postocular spines very
small, a cross furrow behind the latter, the nuchal spine reaches
to the base of the third and the humeral to that of the fifth
dorsal spine; opercular spine short, the third dorsal spine is the
longest and is half the length of the head.

Fins.—The pectoral extends to the third, fourth, fifth or sixth
anal ray, it is 1.1 in the head or 3.1 in the total: the upper
chiropod does not nearly reach the tip of the ventral.

Scales.—The scales are spinous, spines of dorsal scutes strong
and sharp.

Colours.—General colour red, the outer rays of the pectoral
are colourless, the inner ones, including the membrane are black
on the inner side, the colour showing through on to the outer
side as bluish grey.

Length.—163 mm.

Taken from Otago to the Bay of Plenty at depths between
20 and 105 fathoms, and freely trawled at the Chatham Islands
also.

PLECTOGNATHI.

Family MONACANTHIDÆ.

PSEUDOMONACANTHUS Bleeker, 1866.

Two distinct species of the genus have been previously confused
they may be identified by the following characters:—

- | | | |
|-----|---|------------------------|
| a. | Gill opening under hinder half of eye,
pectoral behind posterior margin of
orbit, skin very rough when rubbed
forwards | <i>scaber.</i> |
| aa. | Gill opening under front half of eye,
pectoral below middle of orbit, skin
velvety | <i>convexirostris.</i> |

PSEUDOMONACANTHUS SCABER, Forster.

ROUGH LEATHER JACKET.

Plate LVI.

Balistes scaber, in Bloch and Schneider, Syst. Ichth., 1801, p. 477.

Station 28.

D. ii. 35; A. 35; P. 13; C. 12.

Length of head 3.2, height of body at the vent 2.1, length of caudal 3.4 in the total; diameter of eye 3.4, length of snout 1.3, and interorbital space 3.0 in the head.

The gill opening is oblique and placed under the hinder part of the eye, being separated therefrom by an interval less than its diameter; the nostrils are close together, placed in front of the upper part of the eye. The head is deeper than long, and the upper profile is sinuous, being concave over the snout; the interdorsal space is also concave; the ventral process is markedly extensible.

Fins.—The dorsal spine stands over the hinder half of the eye, midway between the end of the snout and the origin of the dorsal rays; its length is 1.7 in the head; the hinder barbs are large, six or seven in number; the anterior ones are small; the middle rays of the dorsal are the longest, about one-third longer than the eye: the anal rays are similar, but lower; they originate and terminate relatively posterior to those of the dorsal: the ventral spine is fixed, large and with prominent spikes, one of which is directed forwards: the pectoral has a long fleshy base and the actual rays arise behind the vertical of the eye; the caudal is rounded and the depth of its peduncle is one-half more than the diameter of the eye.

Scales.—The scales are furnished with sharp points which make the skin so rough that the finger cannot be freely rubbed in a forward direction.

Colours.—The general colour is warm yellow, the upper parts reddish with brown markings, which are variable: the specimen described and figured is marked as follows:—A brown stripe from above the nostrils passes over the eye to the caudal; two dark marks below the dorsal rays and two similar ones at the base of the anal: a dark line from the eye to the mouth, and another below it; a wider one in front of the gill opening; all reach the ventral profile; there is also a clouded area beneath the pectoral fin, the colour spreading fanwise below.

Length.—196 mm.

This species was taken only at Station 28. six miles east of Oamaru, in 19-22 fathoms. I also have examples taken in Lyttelton Harbour.

Writing under *Monacanthus peronii* Günther⁵⁴ has the following note:—" *Balistes scaber* (Forst.) from Queen Charlotte's Sound, New Zealand, appears to be allied to this species; but the manuscript drawing made by Forster represents the dorsal spine as much more slender, without strong anterior barbs, which are most characteristic of *M. peronii*. The outline of the snout of *B. scaber* is concave."

Hutton⁵⁵ also refers to this species of Forster, and, placing it under *M. convexirostris* Günther, remarks that it "was most likely this species," and again⁵⁶ "This is certainly the *Balistes scaber* of Forster." Since that time *Balistes scaber* has disappeared from the New Zealand list, but I feel quite justified in identifying the present specimens with Forster's species, and in pronouncing the two as distinct as will be evident from a comparison of the accompanying illustrations, if my interpretations are correct.

PSEUDOMONACANTHUS CONVEXIROSTRIS Günther.

SMOOTH LEATHER JACKET.

Plate LVII.

Monacanthus convexirostris Günther, Cat. Fish. Brit. Mus. viii., 1870, p. 248, Hutton, Cat. Fish. N.Z., 1872, p. 71, and Hector, *ib.*, p. 120, pl. xii., fig. 114.

Stations 70, 78.

D. ii. 36; A. 36; P. 12; C. 12.

Length of head 3.4, height of body at the vent 2.3, length of caudal 4.3 in the total; diameter of eye 4.0, length of snout 1.1, and interorbital space 3.3 in the head.

The gill opening is oblique, placed under the anterior half of the eye, its distance therefrom is less than the vertical diameter of the orbit: the nostrils are close together, placed in front of the middle of the eye. The head is deeper than long and the upper profile is almost flat; the interorbital space is convex: the ventral process is very extensible.

Fins.—The front edge of the dorsal spine stands over the middle of the eye, and midway between the end of the snout and the dorsal rays; its length is 1.46 in the head; two rows of

(54) Günther, Cat. Fish. Brit. Mus. viii. 1870, p. 249.

(55) Hutton, Cat. N.Z. Fish, 1872, p. 71.

(56) *id*, T.N.Z.I. ix. 1877, p. 354.

about sixteen barbs behind, of moderate size, and two rows of smaller ones in front: the longest rays of the dorsal, anal and pectoral are equal, and are 2.7 in the head or one-half longer than the eye: the base of the anal is but little shorter than that of the dorsal, but it has a more posterior insertion: the ventral spine is fixed, rugose, with small spines: the base of the pectoral is short and is placed below the middle of the eye: the caudal is rounded and the depth of its peduncle is one-half greater than the diameter of the orbit.

Scales.—The scales have each about six or seven spines on their margins, but the spines are so small and soft that the skin feels velvety when rubbed either forwards or backwards.

Colours.—The general colour of the body is brownish-grey, the portion behind a line drawn from the eye to the origin of the anal is ornamented with regular dark blotches somewhat smaller than the eye.

Length.—309 mm.

The Smooth Leather Jacket was taken to the northward of Cape Turnagain, in 18 to 24 fathoms, it was also trawled in Hanson Bay, at the Chatham Islands, in 33 to 45 fathoms.

THE OUTCOME OF THE EXPEDITION.

The stated objects of the expedition have been referred to in the introduction, and it will be seen that they were of purely economic import.

Investigations were to be made only in direct connection with the food fishes, their distribution and the grounds suitable for their capture, and to place the information obtained on record for the guidance of those interested in the trawling industry.

These objects have been well attained, as will be evident by a study of the official report to which I have previously alluded. The report is very exhaustive; it contains information which can be obtained from no other source; and it should be in the hands of all who are interested in the fishing industry of the Dominion.

The information contained therein relative to the nature of the sea bottom in the areas prospected, and their suitability or otherwise for working the trawl is extremely valuable, and it is almost unnecessary to mention that it is nearly as important to know the rocky stretches, or those strewn with river drift-wood or other obstructions, so as to be made aware of satisfactory trawling grounds. It requires but a small fixed object to do irreparable damage to the net, or if it can be mended it may involve the expenditure of valuable time in its reparation. Two sets of gear are usually carried on trawlers, but it sometimes happens, as was once our experience, that the nets are badly ripped at successive hauls, when work has to be suspended until one of them is again made good.

Another feature of the report is the approximate number of marketable fish taken in the different hauls at the various localities exploited. I have used the term "marketable" in preference to "edible," because there is an abundance of good wholesome fish-food regularly taken in our waters, and thrown overboard again, being regarded as unsaleable. A bountiful supply of fish, even if it is second rate, might tend to lower the price of the commodity as a whole, and its introduction would not therefore be regarded with favour by those who conduct the sale of fish in our centres, though increased sales would doubtless more than restore the balance. I know no reason why the Red Cod (*Physiculus bachus*) should not be more freely eaten: this species was taken by tons, but it is not in much demand in the

markets; yet, when eaten fresh, as all fish should be, it is extremely palatable, and considering its plenitude could be sold at a moderate price.

Though excellent as food, there is considerable prejudice against eating the flesh of eels; this is doubtless largely due to the interpretation of the biblical injunction against eating fishes devoid of fins and scales:—

“And whatsoever hath not fins and scales ye may not eat.”

All eels are generally regarded as being scaleless, but this is not so, for members of the family of fresh-water eels (*Anguillidae*) have true scales imbedded in their skins, which become quite apparent when the skin is dried; they also have ample pectoral fins, so that even those who desire to conform to the Mosaic law, need have no compunction in eating the fresh-water eel, under the belief that it is scaleless and finless.

Personally, I prefer the Conger Eel (*Leptocephalus*), a species which, though possessing fins similar to the fresh-water eel, is absolutely devoid of scales. This fine sea eel is not uncommon in our waters, and attains to a length of at least seven feet; it possesses the recommendation of being very fleshy, and the large bones cannot be overlooked. The fresh-water eel abounds in our lagoons, and is a very great favourite with the Maoris. It is so plentiful in Lake Ellesmere, for example, that a boat may be filled with them in a night by a few sportsmen furnished with torches and eel-spears. Eels are accounted of better flavour when taken in the estuaries than when drawn from fresh-water.

To those who have no innate prejudice against eels, but who dislike the flesh as such, it may be said that everything depends upon the way in which they are cooked.

“One more piece of advice, and I close my appeals—

That is—if you chance to be partial to eels,

Then—*Crede experto*—trust one who has tried—

Have them spit-cock'd—or stewed—they're too oily when fried!”

Being desirous of tasting as many different kinds of fish as possible, it will be understood that our *menu* on the trawler was somewhat varied as far as fish is concerned. On one occasion we had Elephant Fish (*Callorhynchus*) on the “saloon” table, and found it to be of quite delicate flavour and texture: the crew, however, to whom it was also served refused even to taste it, threw it overboard, and, if I mistake not, complained to the master that the cook was serving them with shark for meals; considering that there was plenty of prime fish on

board one could not blame the men who could not, of course, be expected to treat their dinners experimentally, but the act was one of sentimental prejudice only. The flesh of the Elephant Fish is really good, and would be welcomed in a country poorer than New Zealand. I may add that in Canterbury Bight and Pegasus Bay this species formed quite a substantial percentage of the total takings of the net.

Few native born New Zealanders will eat Skate (*Raja nasuta*), yet in Britain where there are nine or ten species of the genus *Raja*, skate is an important food fish, and the New Zealand representative has a food value possibly equal to the best of them. It has the further recommendation of being very common and easily captured, for it is one of those ground forms which can scarcely escape the trawl.

The prejudice against eating the flesh of Dogfishes is not confined to New Zealand, but is fairly general, and may be traced to several sources. The Dogfishes are, of course, small sharks, and the general odium attached to the name shark is in itself calculated to arouse a certain amount of abhorrence. Then the names applied to the several kinds individually, suggest unpleasant associations. Our two common species are respectively known as Smooth Hound and Spiny Dogfish, while Dog Shark, Spotted Dog, Catshark, etc., are names by which other species are known, in contradistinction to Leopard Shark, Tiger Shark and other names applied to larger species.

The small Dogfishes are freely eaten by the poorer people in Britain, while there is reason to believe that American species are exported to England and sold freely, probably under disguised names. Possibly owing to the proximity of the famed fishery investigation establishment, it is said that the Plymouth* Borough Council engaged the services of an expert chef to prepare dogfish for the aldermanic table. The flesh was tried both with and without sauce, and those who partook of the food pronounced it to be excellent in regard to colour, flavour and the firmness of the flesh. For this information I am indebted to an article published by Dr. Irving A. Field,⁵⁷ from which I make the following additional quotations:—

“The Dogfishes are not only palatable in the fresh condition, but are as good as many other fishes when preserved by the standard methods. The horned dogfish being in composition most like the salmon is best adapted for canning, and is considered as good as the medium grades of salmon. A packer in Petit de Grat, Cape Breton, in 1904 sent me a dozen cans of

(57) Field, Bull. U.S. Fish. Bureau, xxviii. 1908, p. 243.

dogfish he had packed. I passed them around to my friends, who prepared the contents in different ways (fried, scalloped, creamed, etc.). In these forms the canned article was highly praised in flavour and palatability. Samples were also sent to several hotels, where the fish was served to the guests as 'Japanese halibut,' and was pronounced most acceptable. An establishment at Halifax has been canning large quantities and putting them on the market labelled 'ocean whitefish.' A firm at Charlottetown, Prince Edward Island, has been successful in selling the canned articles as 'sea bass.'

"The smooth dogfish found south of Cape Cod is preserved best by salting and drying according to the same method employed for preparing dry salt cod. The product very much resembles cod, but has the advantage of being boneless. I have had creamed salt dogfish served in the mess hall of the Marine Biological Laboratory to a score or more of persons. They all reported that they could detect little or no difference between it and the ordinary salt codfish.

"The flesh of the dogfish is apparently just as digestible as that of other fishes, is palatable, nutritious, and easily preserved. The fish are so abundant and easily obtained that they are ridiculously cheap. But prejudice is barring this wholesome food from our menus. People seem more willing to starve than to eat this fish, just because it bears the name 'dog.' The problem now is how to put the fish on the market without an offensive label and at the same time meet the spirit and letter of our pure-food law."

I have heard it alleged that we rightly don't eat dogfishes because they are flesh feeders, as are lions, tigers, dogs and cats, and that man feeds only upon vegetable fed flesh as that of cattle and sheep. The speaker was unaware that nearly all the fishes we most prize for the table are carnivorous, and that the comparatively few kinds which feed upon algae, or seaweed, are not as a whole, in great demand, and require to be eaten quite fresh in consequence of the poor keeping qualities of the flesh.

The habits and food of our two dogfishes differ considerably: the smooth hound (see page 140, plate xiv., fig. 2) is a ground feeder, preying upon various kinds of crabs, and it may possibly become an enemy of the English lobsters which were imported and have thriven well and bred in the enclosures prepared for them at the Portobello Marine Fish Hatchery. If the lobsters multiply to such an extent as to warrant a number being turned adrift into the sea it would be well to choose the site very carefully to ensure all the necessary conditions being present, and if suitable shelters are absent to supply such under which the lobsters can retreat.

The spiny dogfish (see page 142, plate xvi., fig. 1) is, on the other hand, an active predaceous species, and follows up the shoals of herrings, pilchards, silversides and other fishes. Dr. Field says of the American species that the flesh of the smooth dogfish is free from oil, resembling most closely the cod, and that the flesh of the horned dogfish (allied to our spiny dogfish), contains a large percentage of oil, and in this respect most closely resembles the salmon.

Fashion in food as in other things may be determined by necessity; and hunger is a good cure for prejudice: though it may not be actual want which has brought about the change below referred to, there can be small doubt that the increasing scarcity of fish in the home markets, due to depletion of the trawling banks and consequent rise in price, has resulted in the greater consumption of the so-called coarser fish, for Mr. F. G. Aflalo⁵⁸ tells us that the smaller dogfishes find a ready market to-day at Brighton and elsewhere on the South Coast, where twenty years ago they would have been thrown away as offal.

Reverting to a consideration of the official report, the list of different fishes taken at the various stations, is also a useful feature, though as previously remarked, the value of the records is somewhat discounted by the fact that the determinations are too general and in some cases inaccurate; this will, however, be remedied to a considerable extent by the present publication, the *data* for which were independently obtained.

Though I have no direct evidence that extended trawling has been commercially undertaken as a result of the expedition, it would appear that the favourable report published as to the potentialities of the Chatham Islands for line fishing has been distinctly effective in placing capital into what it is hoped may be a remunerative venture. The company formed to exploit the Blue Cod and Hapuka fisheries is employing the "Nora Niven" to taken the catches to Wellington, but it is most disheartening to learn that the fishes are being shipped thence to Australia. Considering the high price of fish in New Zealand, one would have thought that the catches could have been disposed of here at prices at least equal to those of Melbourne or Sydney. As there is evidently something prejudicial to the sale of the fish in our own markets, some official enquiry should surely be made to ascertain the true condition of affairs. It seems anomalous that the people of this country should pay for a survey of the fishing grounds of the Dominion, and not be able to reap the benefit of the outcome thereof. It may of course

(58) Aflalo, *British salt-water Fishes*, 1904, p. 85.

be said that this undertaking is not the result of the work performed by the expedition, but it is at least significant that in the official report particular stress was laid upon the plenitude of fish at the Chatham Islands, and it was stated that "it is extremely probable that the Chatham Islands will in the near future become one of the most important sources of our fish-supply." In any case, this does not alter the fact, as stated in the public press, that the fish is not being consumed at our own tables.

Though the trawl is a selective instrument of capture, taking, as a general rule, only those animals living on or near the floor of the ocean, it secures most of the organisms within scope of its area of operations. It will be evident therefore, that though it will capture the food fishes which it encounters, it will also secure other fishes and other forms of animal life outside the limitations officially imposed on the undertaking. The present report is therefore another though indirect product of the expedition. It may be regarded as supplementary to the official report, dealing largely with a study of the products outside the official cognisance. At the same time the economic fishes have been treated more liberally than other forms, so that it may appeal to popular as well as to more purely scholastic circles. The species have been dealt with in the exact manner that science demands, the result being the recognition of many more, even economic species, than are enumerated in the official report.

The total number of fishes included is eighty-five of which eleven are described as new to science, some of these have been previously associated with Australian or other species, but are now found to be different. Others, though known elsewhere, are now recognised for the first time as belonging to the New Zealand fauna.

Though no attempt has been made to revise the synonymy of all the species included in the report, special attention has been devoted to the flatfishes, and with the aid of the synopsis supplied and the accompanying illustrations, there should now be small difficulty in identifying the several species of this family at present known from New Zealand seas. A glance at this portion of the report will show how very involved the literature of the subject is, as applied to New Zealand species, and suggests that a thorough revision of the whole of our fishes is necessary.

The records show that, as would naturally be expected with our extensive seaboard, fish is numerous and varied, but as the area between the extreme points of the Dominion stretches through thirteen degrees of latitude the range of water temperature, difference of food supply and other conditions

operate in limiting the northern and southern distribution of some of the species, thus, for example, the Schnapper, Yellowtail (Northern Kingfish), John Dory, Cucumber fish, Mackerel, Trevally and Kahawai are commoner in the North Island, while the predominating southern forms are the Hake or Whiting, Kingfish, Blue Cod, Butterfish, Frostfish, etc.

Many species, however, range along the whole of the coast line, including Red Cod, Barracouta, Tarakihi, Ling, Hapuka, and many of the flatfishes, while one, the Black Flounder, is a fresh-water species. Considerable information was also gained as to the depths at which the different kind of fishes were most abundantly met with—it should be added—at the season at which the undertaking was conducted,—for it must not be supposed that the same results would be met with the year round.

The illustrations which accompany the report will be distinctly useful, and in the preparation of these I desire to acknowledge much help rendered by my assistant, Mr. Frank A. Pollard.

Fifty-two different kinds of fishes are illustrated, this number includes the sharks and rays, etc., which appeared in the first part of the report, and other fishes which are not directly of economic import, though many undoubtedly serve as food for edible species.

In keeping with the text, representations of the flat fishes have been more generously furnished, and the whole of the species which, as far as I am aware, find a place in our markets have been illustrated.

Of the less economic portion of the report it may be noted that Professor Benham records five new species of Echinoderms, Mr. Henry Suter eight new species or varieties of Molluscs, while Dr. Chilton finds that though all the Crustaceans were previously known, one of them is an addition to the New Zealand fauna. The enumeration of the new forms does not, however, exhaust the interest of the communications, for several of the others had never been seen since they were first described, and were in danger of removal from the list as doubtful records. Dr. Chilton refers to the enormous numbers of Crayfish which we trawled at the Chatham Islands, and also mentions having seen them in shallow water at Dusky Sound in 1908. Being myself a member of the party which visited the South-west Sounds in that year I was also struck with the congregations of Crayfish mentioned by my friend, and cull the following from an article I wrote for the newspapers at the time:—

“Pulling over a sandy flat, large masses of brown seaweed were encountered, at least they were so regarded until the water glass was brought into requisition, it was then found that each

seaweed-like mass was a great cluster of Crayfish, numbering from thirty to fifty individuals. Many were caught by means of a baited hook; while in very shallow water, isolated individuals were captured by hand, a somewhat sensational sport. It was observed that every example taken was a male, the females were possibly hiding beneath stones, engaged in maternal duties, this being their habit as observed at the Marine Fish Hatchery at Portobello." I have also the following note on *Munida gregaria* made about the same time: "On one occasion what was thought to be a large frond of red seaweed was floating near the surface, the water glass showed it to be a school of red crustaceans known as whale-feed. Three fishes suddenly rose among them and the little creatures scattered in all directions."

The reports on the Cephalopods and Nudibranchs, which were sent to England for examination have not reached me up to the time of going to press.

It is unfortunate that it was not found possible to have fuller observations made or collections preserved during the operations conducted on the extended cruise, and we may hope that in future the advisability of having at least one trained zoologist on board may not be lost sight of. I am simply stating a fact when I mention that no mere collection, however conscientiously made, can be got together by untrained men; the small differences which sometimes characterise allied species, or the outward similarity of forms which possess no close relationship to each other, are not appreciated. Further, it is not possible even for the trained man to recognise every species of a group with which he may be familiar, without careful comparison, made with the necessary tools and books to hand, and impossible on a commercial trawler. That this applies to the primeest edible species as well as to those of lesser account will be evident from my remarks on the flatfishes to which I may again be permitted to refer.

While recognising the extremely useful work which the Government has so far done in adding to the knowledge of our marine resources, the operations to date should be looked upon as preliminary. They should not only be continued in the future but should be certainly extended to embrace further avenues of research. There are many problems which await solution before we can claim to have any adequate knowledge of our fish resources, but these can only be solved by patient and continued effort. We already know something of the various kinds of fishes which inhabit the waters within easy reach of existing markets, but of those which may frequent less accessible localities we are in almost total ignorance, and of the possibilities in this direction we cannot speak. Taking into account, however, only

those kinds with which we are familiar, many pertinent questions may be asked to which we have no answer. Of how many of our common market fishes can we say we know the precise nature of their food, and if we know that a certain fish habitually feeds upon, say crustaceans, or upon molluses or upon smaller fishes, we certainly cannot say exactly on our ocean floor where such are to be found: if we did we should be in a position to obtain the fishes of which we are in search. Fishes may, and do vary their haunts at different seasons, perhaps, on the whole, approaching the coasts in summer. At breeding time they may leave their usual feeding grounds and move inshore or into deeper water, according to their kinds, and this brings us to the important question of spawning: we require to know exactly at what season the fishes shed their ova, their relative fecundity, the position chosen for spawning, what the eggs are like, how those of different species differ, whether they sink, float or are attached to rocks, seaweed or other substances; the peculiarities of their development, the enemies to which both the eggs and the young fishes are subject, at what size the fry leave the breeding ground, and whence they migrate.

Not all this information can be obtained by trawling alone; though the trawl is *par excellence* the engine for securing fishes in bulk, it should be supplemented by the use of dredges, which are designed to secure the smaller organisms upon which they may feed, samples of the bottom whereon the fishes are found, also demersal or sunken ova: for similar reasons tow or surface nets should be employed to secure pelagic organisms (Plankton and Nekton) including floating eggs. It is also necessary to have a shore station where the development of the ova can be studied and various observations and experiments made. Fortunately the Dominion possesses such a station at Portobello, where, if somewhat more generously equipped, the most satisfactory investigations could be carried on.

In newer countries where no great depletion of food fishes has taken place, the needs for such investigations are not apparent, but, learning the lessons which older ones have taught, a time will come when our seas will be relatively less bountiful unless supplemented by artificial means or by importations from richer localities, and at such period it will be rather late to inaugurate observations which should now be commenced and continued towards the end in view.

It is not as though we had to grope our way trying to discover methods of research, Britain, America, Japan and other countries have done this for us, so that all we have to do is to collect the necessary *data* by means already known to us.

There may shortly be afforded an opportunity of witnessing the application of modern methods employed in collecting marine organisms and of collating the *data* obtained; the "Terra Nova," which left our shores a few months ago for the purpose of taking Captain Scott and his party to the shores of Antarctica, is shortly expected to return.

It has been proposed that before again going south, a cruise shall be conducted off the continental shelf of New Zealand for biological research purposes, and it is to be hoped that the project will receive the support of the Government.

In connection with the subject of sea fisheries, it may not be out of place to refer a little more fully to the Portobello Marine Fish Hatchery, the only one of its kind in New Zealand, which, though somewhat inadequately supported, has proved the medium by which it has been possible to publish some very valuable observations indeed. A general account of the hatchery has been supplied by Mr. George M. Thomson, F.L.S., M.P.⁵⁹ together with a preliminary notice of the development of some of the marine fishes; the work has been continued by Mr. Thomas Anderton,⁶⁰ Curator of the hatchery, who has issued a very carefully prepared article on the ova and larvæ of several important food fishes and crustaceans. As previously mentioned, my thanks are due to Mr. Anderton for assisting me with information gained in the hatchery or for specimens which his experience as Curator of the station enabled him to furnish.

Information of the nature supplied by Messrs. Thomson and Anderton is particularly valuable, and will enable workers to identify the eggs of fishes which may be found floating at the surface or drawn from the bottom by means of the dredge; it is by such auxiliary means that the breeding places and periods of the fishes may be ascertained, while, of course the *data* obtained as to the period of hatching and subsequent development is invaluable; unfortunately the hatchery is not sufficiently extensive at present to allow of post larval observations being made for any lengthy period, a matter which is deserving of the best consideration of the Government.

I have previously expressed my thanks to Mr. L. F. Ayson, Chief Inspector of Fisheries, and the several gentlemen who have so kindly examined the collections, it remains for me to render my grateful acknowledgment to the Hon. J. A. Millar, Minister for Marine, for his courtesy in permitting me to accompany the expedition, and further, for placing funds at the disposal of my Board, for the publication of the results in the "Records of the Canterbury Museum." I also desire to acknowledge my appreciation of the kind manner in which the official negotiations have been conducted by Mr. George Allport, Secretary to the Marine Department.

(59) Thomson, T.N.Z.I. xxxviii. 1906, p. 529 pl. lv.-lix.

(60) Anderton *ib.* xxxix. 1907, p. 477, pl. xvii.-xx.

As will be learned from the report on the Mollusca (p. 117), Sir Charles Eliot had kindly undertaken to examine the Nudibranchs collected on the cruise. The specimens were forwarded to him by Mr. Suter, and it is with deep regret that we read the following cablegram published in the New Zealand newspapers, as the foregoing pages were passing through the press:—

“London, May 29th.

“The death is reported of Sir Charles Eliot, Bart. Sir Charles succumbed to syncope, while attending an early communion service. He was 76 years of age, and served in India during the mutiny.”

Sir Charles Norton Edgcumbe Eliot, K.C.M.G., F.Z.S., was Vice Chancellor of the University of Sheffield at the time of his death, and was formerly H.M. Commissioner for the East African Protectorate. In zoology he had specially directed his attention to the *Nudibranchiata*, upon which group he was a foremost authority. His published papers are very numerous, and include reports on collections from New Zealand.

EXPLANATION OF PLATES

PLATE XXIV.

Argentina clongata Hutton.
Slightly reduced.

PLATE XXV.

Chlorophthalmus nigripinnis Günther
About four-fifths natural size.

PLATE XXVI.

Centriscoops humerosus Richardson, var. *obliquus* Waite.
Photograph of a specimen in the Dominion Museum.

PLATE XXVII.

- Fig. 1. *Syngnathus norae* Waite.
Female, two-thirds natural size.
Fig. 2. *Syngnathus blainvillianus* Eydoux and Gervais.
Male, two-thirds natural size.
Fig. 3. *Myctophum humboldti* Risso.
Natural size.

PLATE XXVIII.

Hippocampus abdominalis Lesson.
Fig. 1. Male. Fig. 2. Female.
Both five-sixths natural size.

PLATE XXIX.

- Fig. 1. *Coelorhynchus australis* Richardsor
About two-fifths natural size.
Fig. 2. *Coelorhynchus aspercephalus* Waitc.
About two-thirds natural size.

PLATE XXX.

- Fig. 1. *Macruronus novae-zealandiae* Hector.
Two-thirds natural size.
Fig. 2. *Merluccius gayi* Guichenot.
More than one-fourth natural size.

PLATE XXXI.

- Fig. 1. *Physiculus bachus* Forste..
About half natural size.
Fig. 2. *Auchenoceros punctatus* Hutton.
Five-sixths natural size.

PLATE XXXII.

Cyttus novae-zealandiae Arthur.
Five-sevenths natural size.

PLATE XXXIII.

Capromimus abbreviatus Hector.
One and a half times natural size.

PLATE XXXIV.

Caulopsetta scapha Forster.
Four-sevenths natural size.

PLATE XXXV.

Rhombosolea plebeia Richardson.
Nearly half natural size.

PLATE XXXVI.

Rhombosolea tapirina Günther.
Five-ninths natural size.

PLATE XXXVII.

Rhombosolea millari Waite.
Four-elevenths natural size.

PLATE XXXVIII.

Rhombosolea retiaria Hutton.
Five-ninths natural size.

PLATE XXXIX.

Ammotretis nudipinnis Waite.
One-third natural size.

PLATE XL.

Ammotretis guntheri Hutton.
Three-sevenths natural size.

PLATE XLI.

Pelotretis flavilatus Waite.
Five-eighths natural size.

PLATE XLII.

Peltorhamphus novae-zeelandiae Günther.
Two-fifths natural size.

PLATE XLIII.

Polyprion prognathus Forster.
Three-tenths natural size.

PLATE XLIV.

Cepola aotea Waite.
Natural size.

PLATE XLV.

Cheilodactylus macropterus Forster.
Three-fifths natural size.

PLATE XLVI.

Pseudolabrus coccineus Forster.
Three-sevenths natural size.

PLATE XLVII.

Pseudolabrus cinctus Hutton.
Seven-twelfths natural size.

PLATE XLVIII.

Pseudolabrus pittensis Waite.
Two-thirds natural size.

PLATE XLIX.

Coriodonax pullus Forster.
One-third natural size.

PLATE L.

Seriocella brama Günther.
Four-sevenths natural size.

PLATE LI.

Seriocella punctata Forster.
Four-fifths natural size.

PLATE LII.

Rerea furcifera Waite.
About one-third natural size.

PLATE LIII.

Parapercis gillicsii Hutton.
Natural size.

PLATE LIV.

Fig. 1. *Hemerocoetes acanthorhynchus* Forster.
Fig. 2. *Hemerocoetes microps* Waite.
Both two-thirds natural size.

PLATE LV.

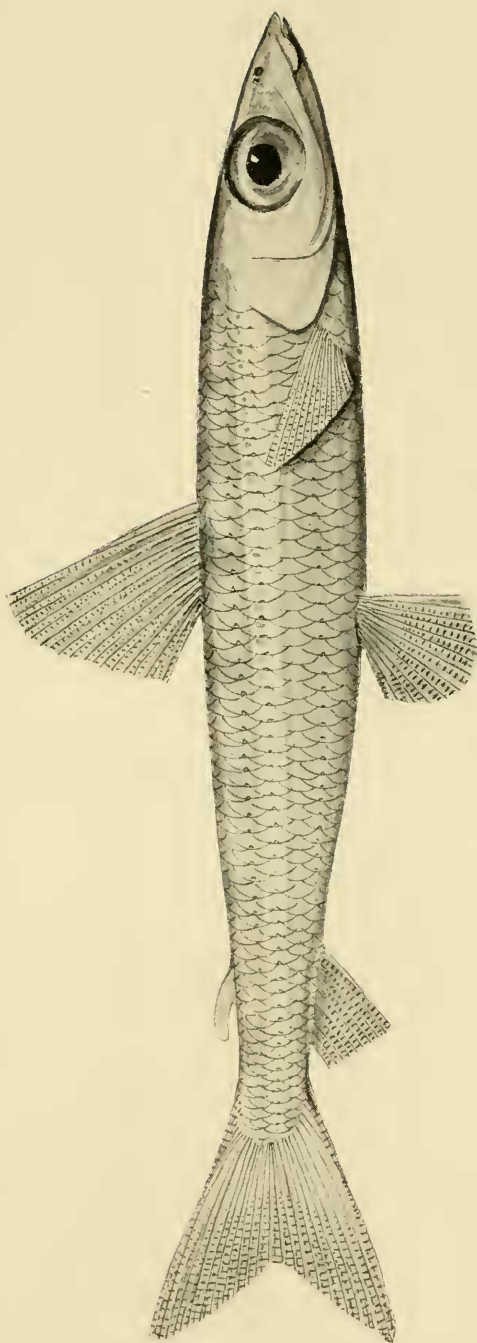
Pterygotrigla picta Günther.
Three-fifths natural size.

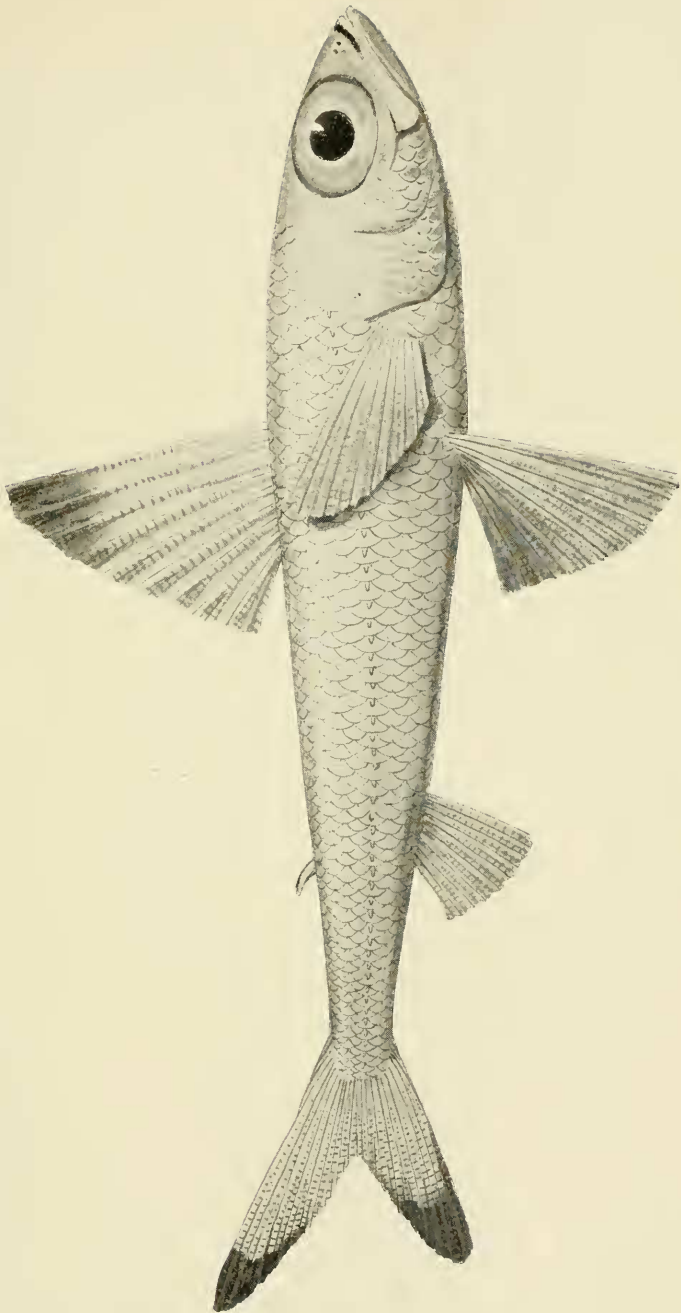
PLATE LVI.

Pseudomonacanthus scaber Forster.
Natural size.

PLATE LVII.

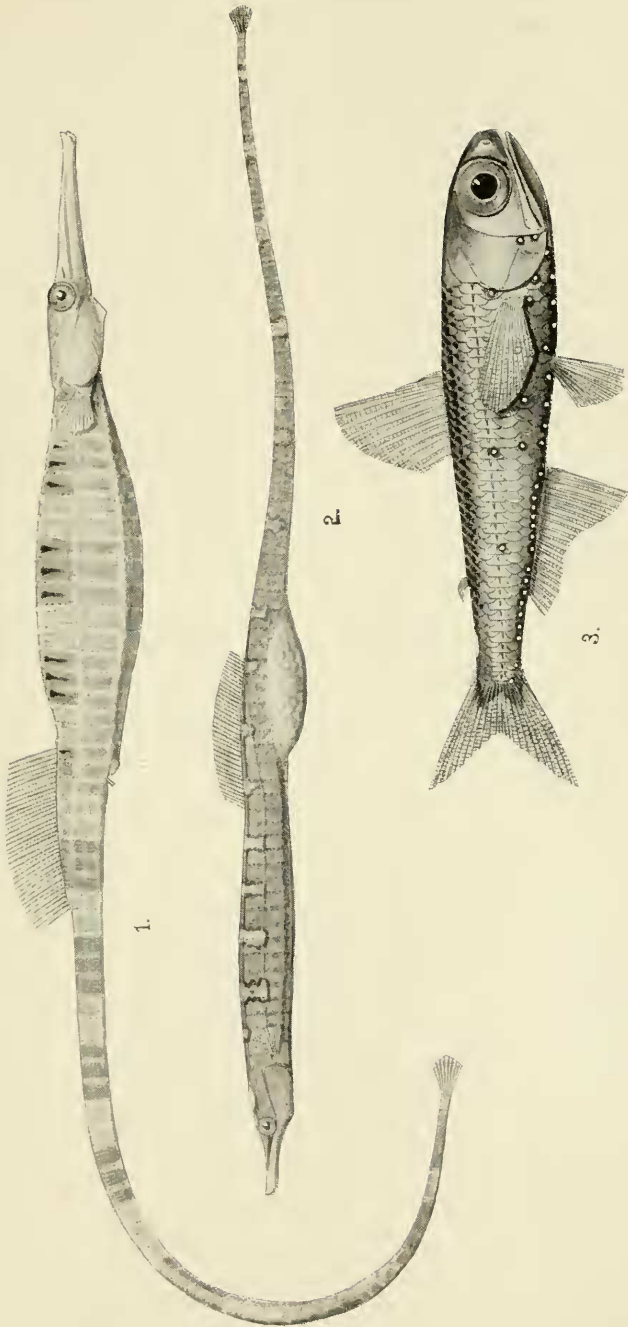
Pseudomonacanthus converirostris Günther.
Three-fifths natural size.

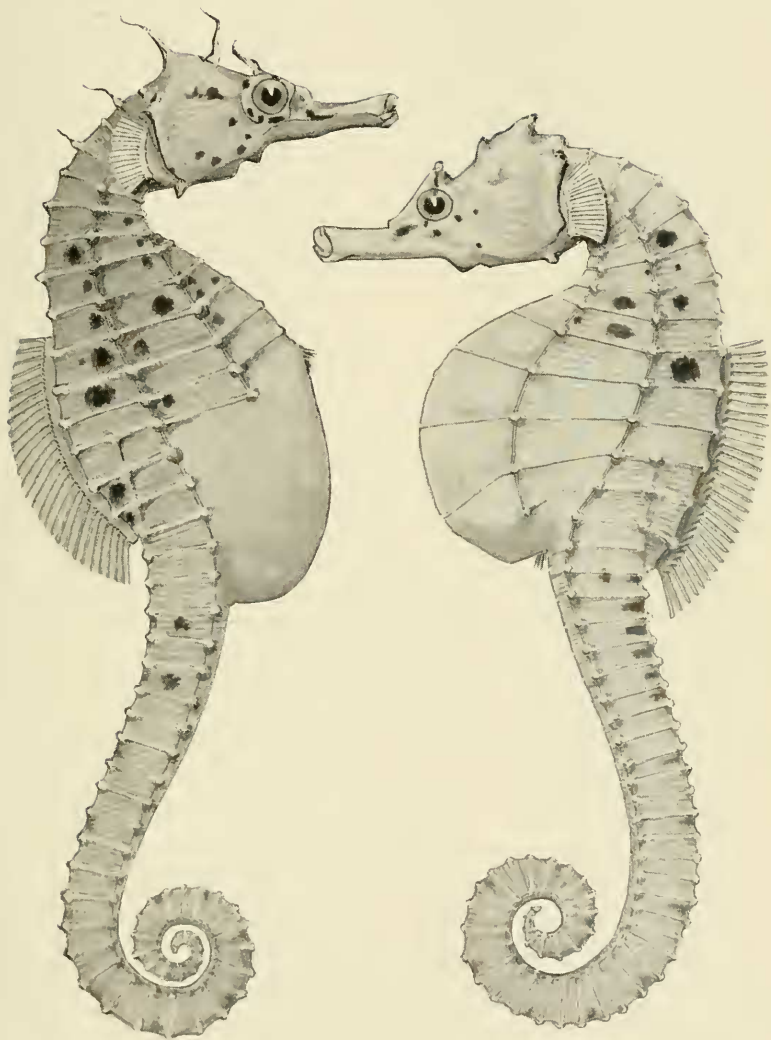




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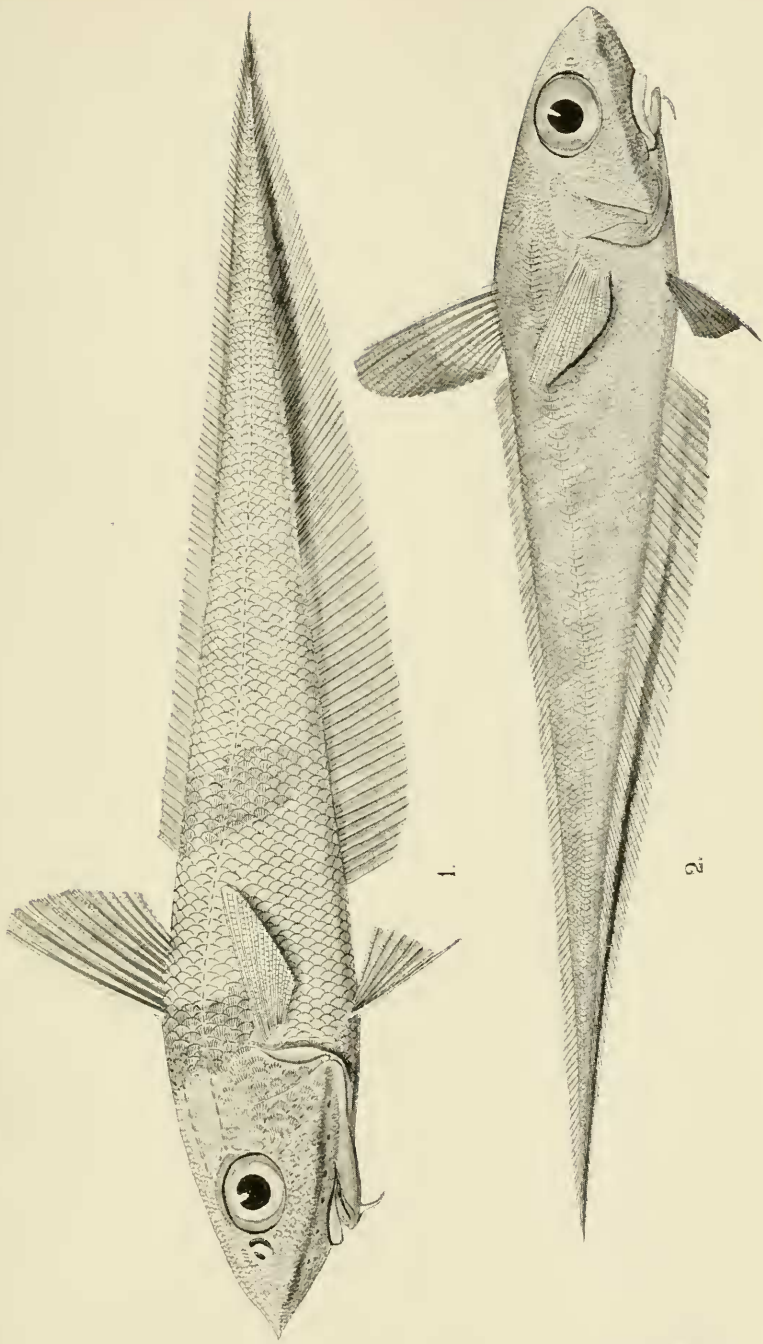


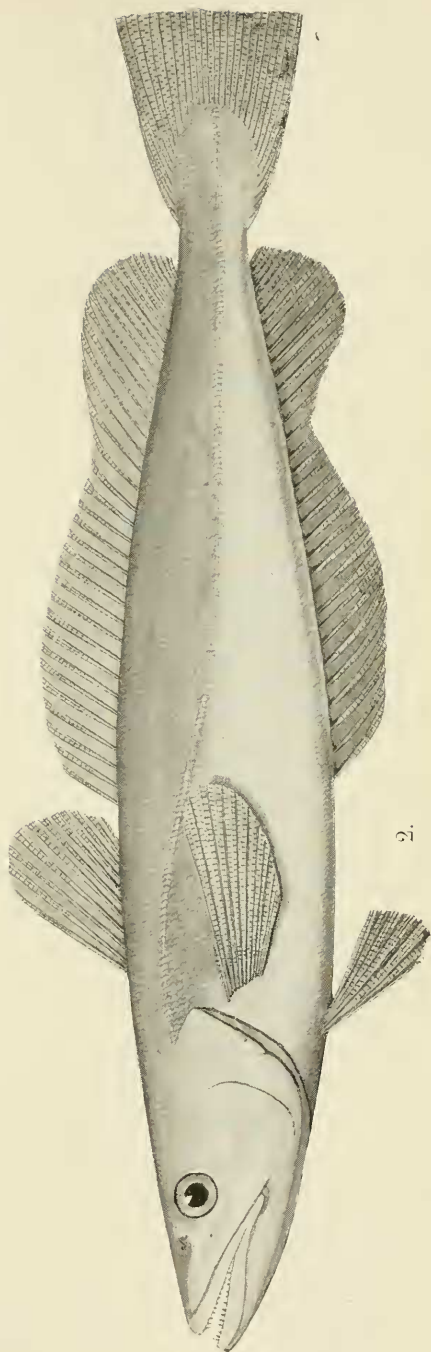
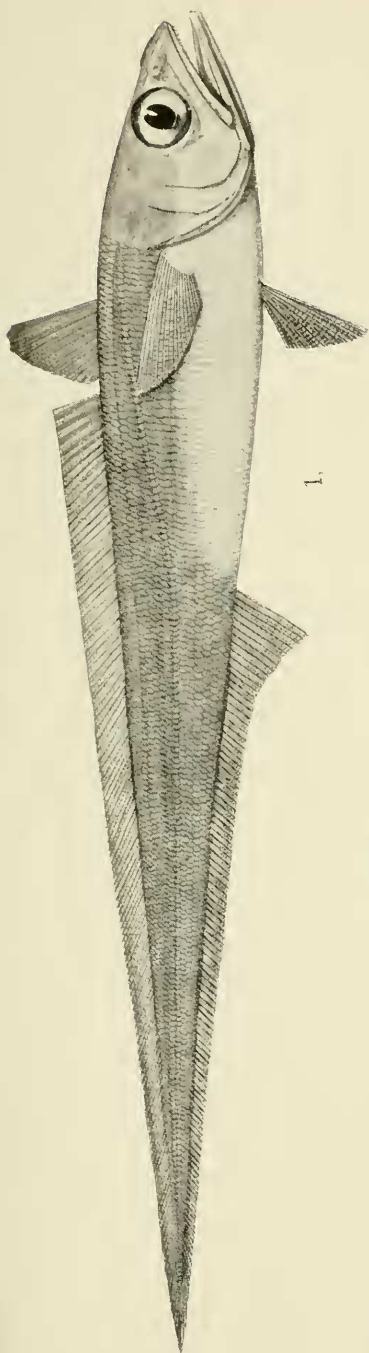


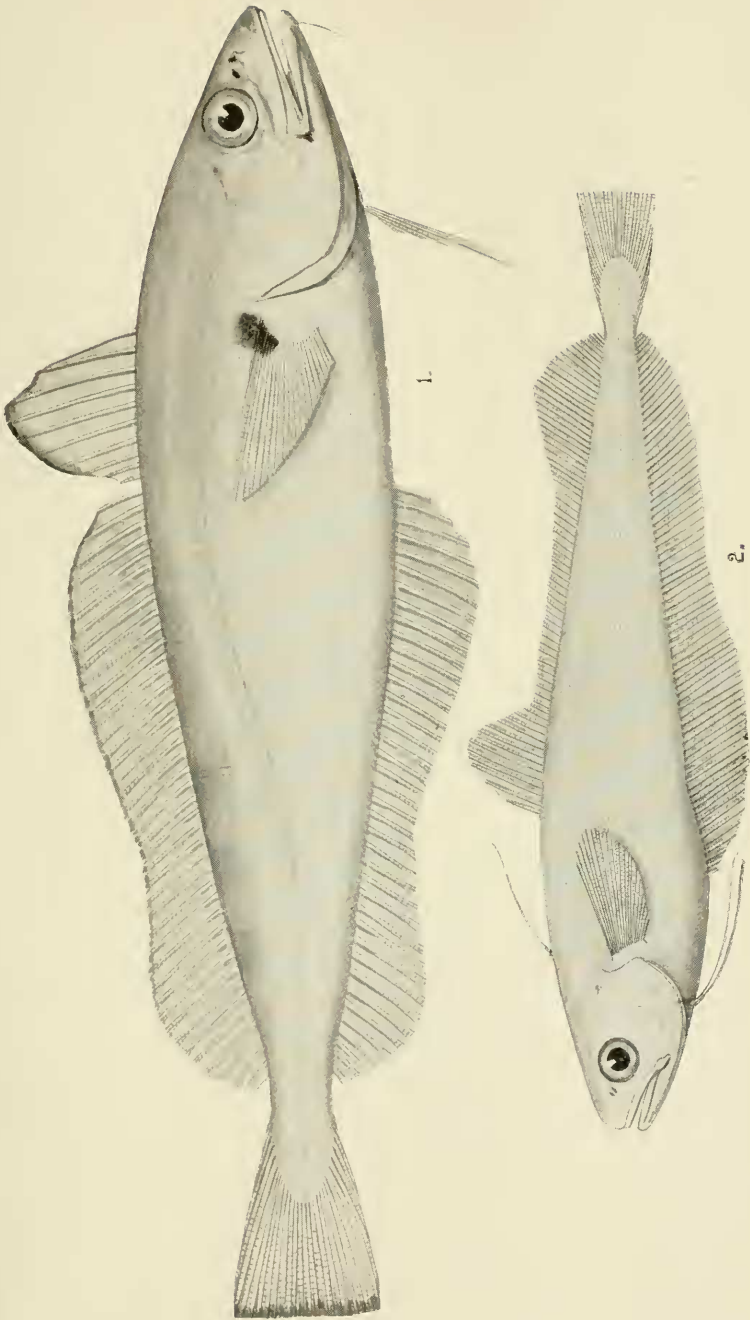
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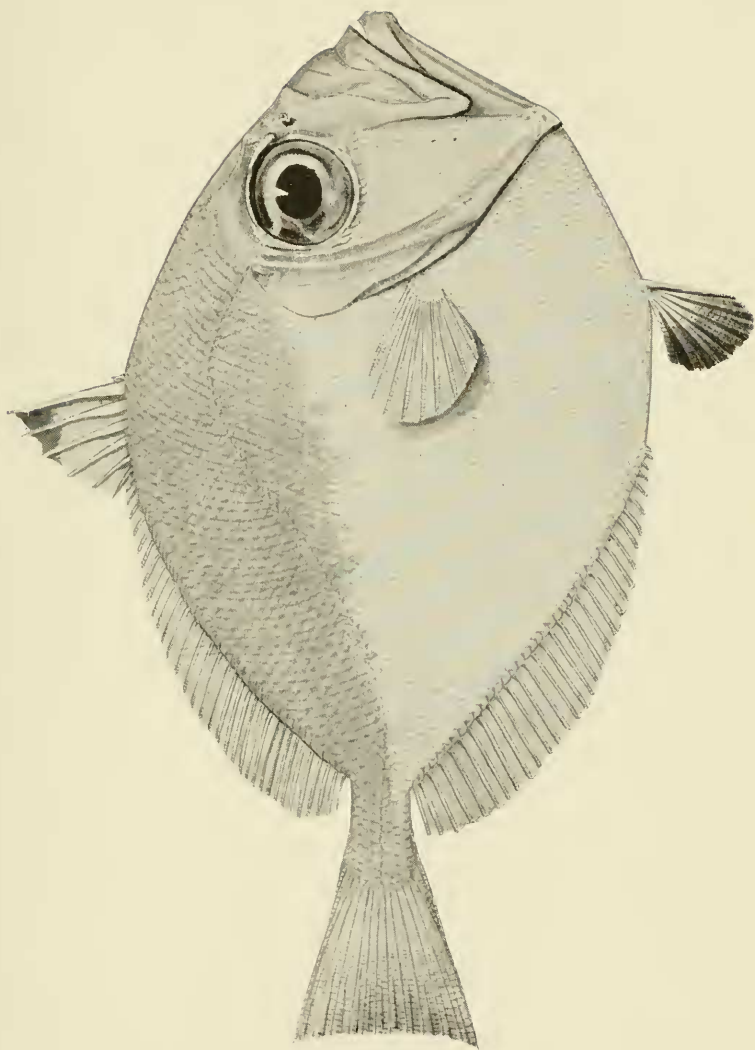
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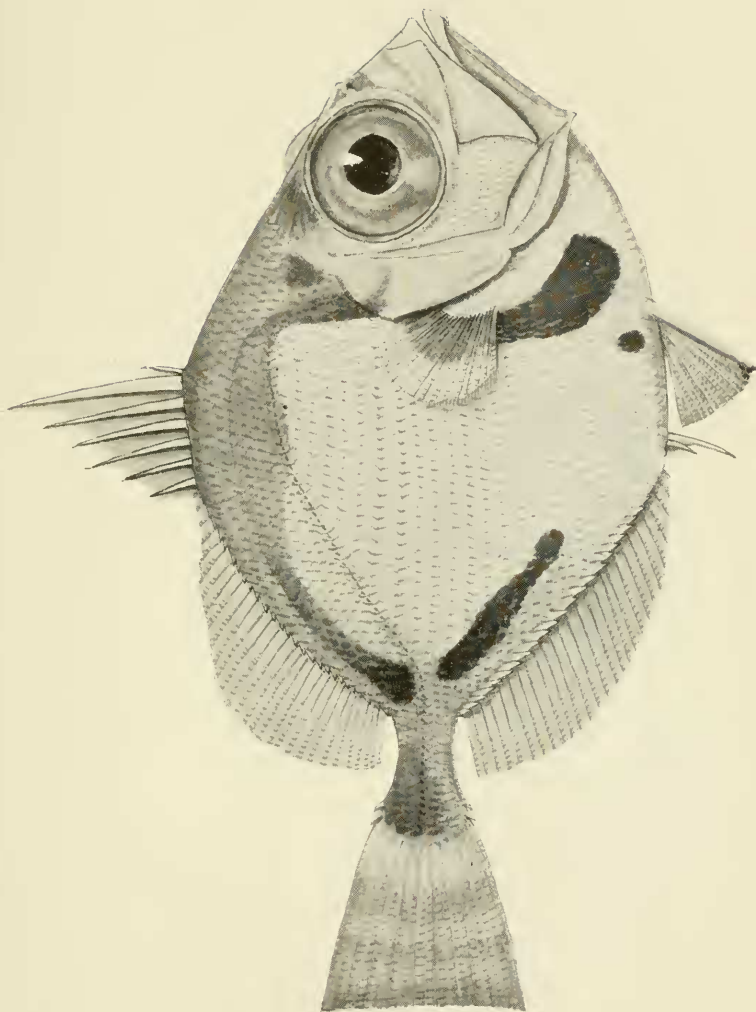
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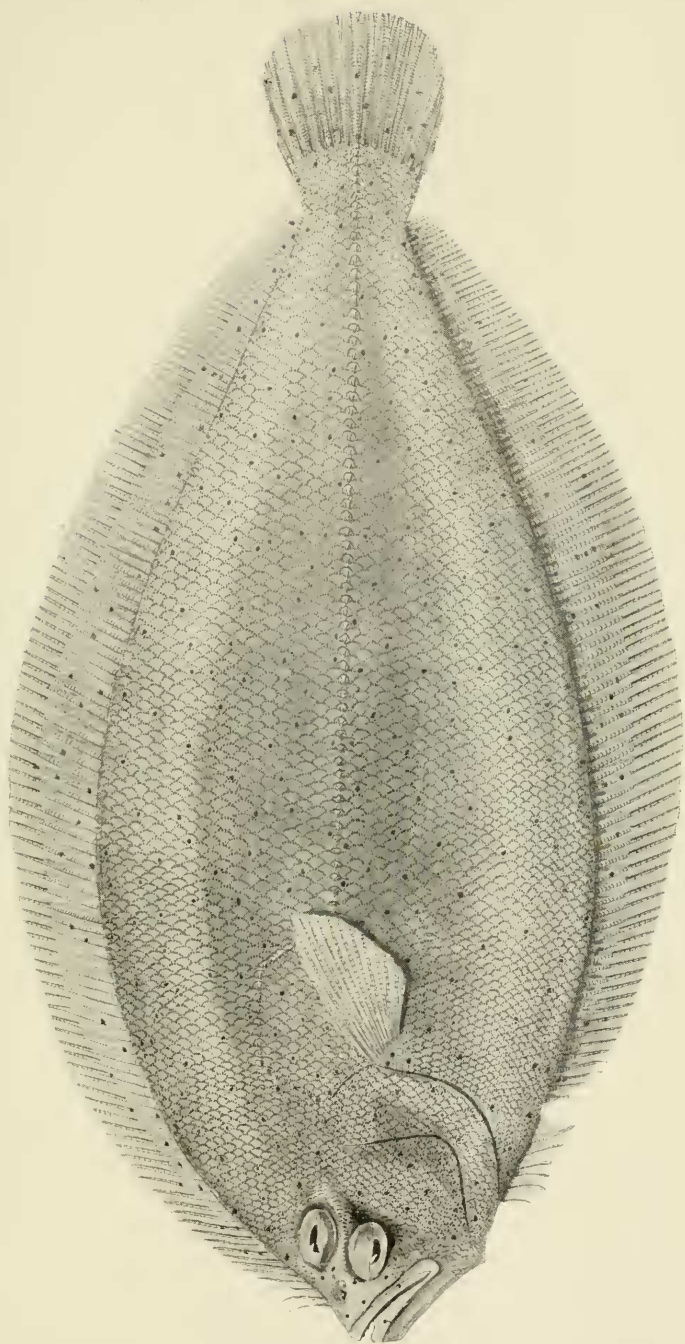


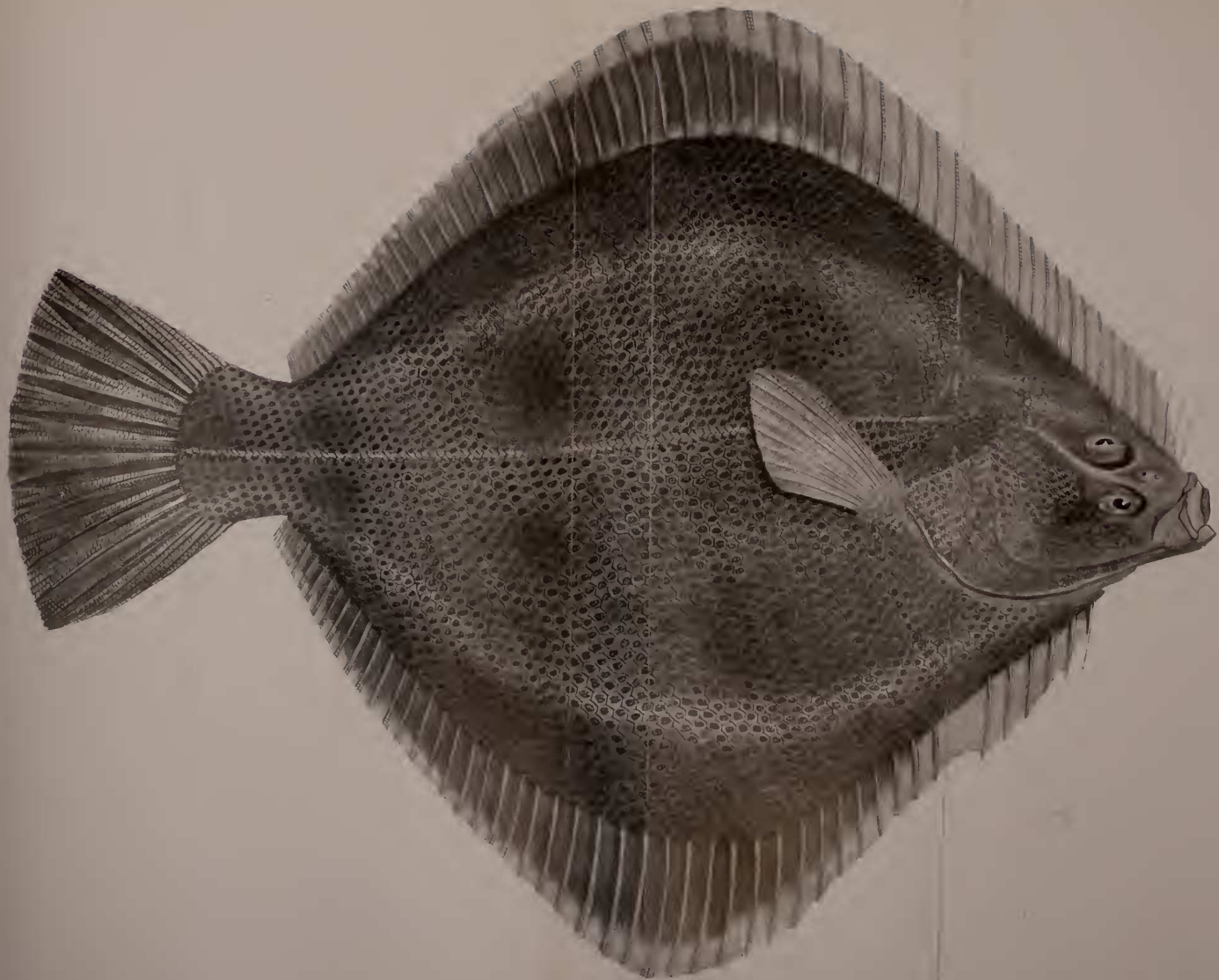


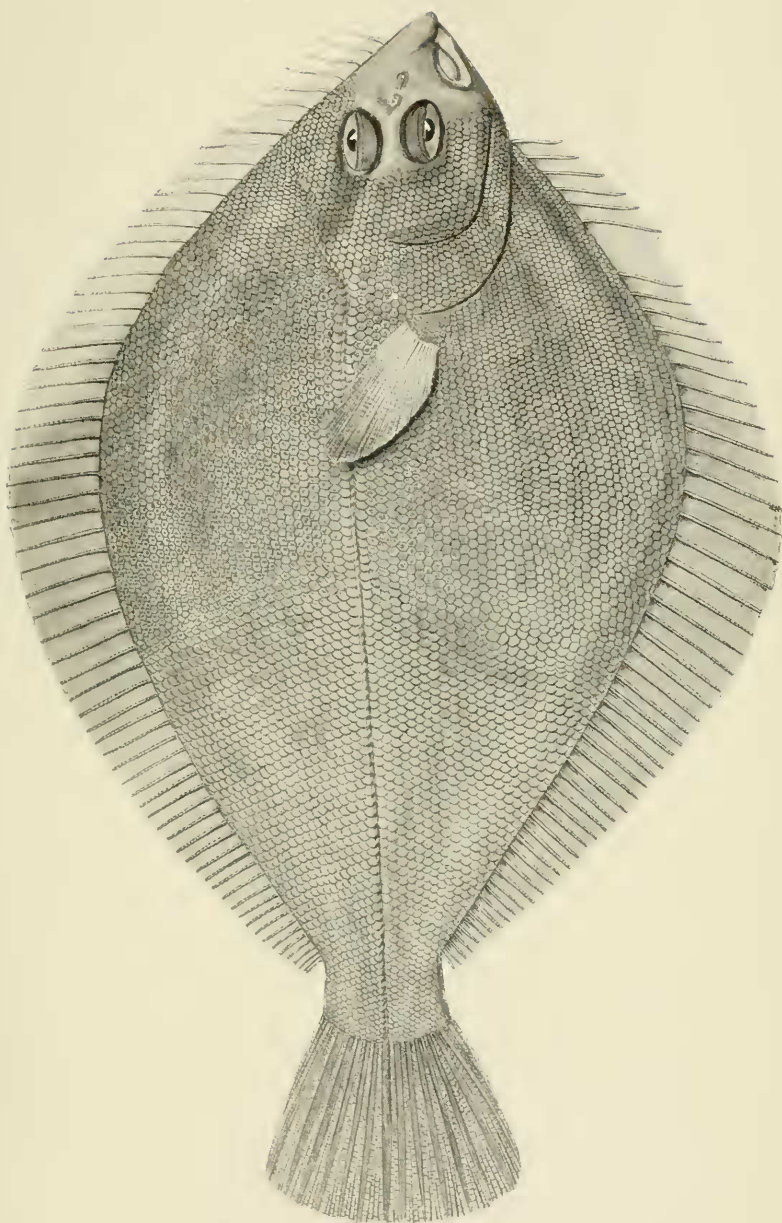


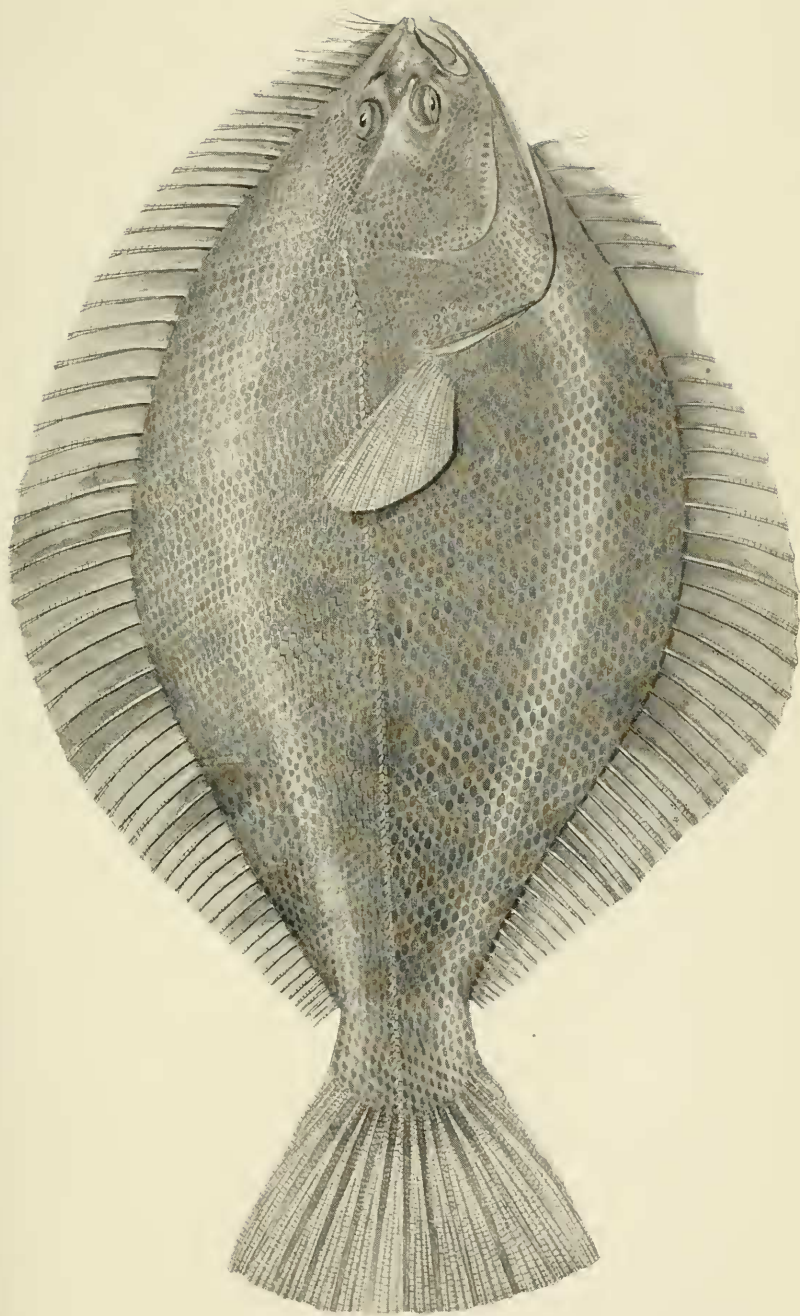


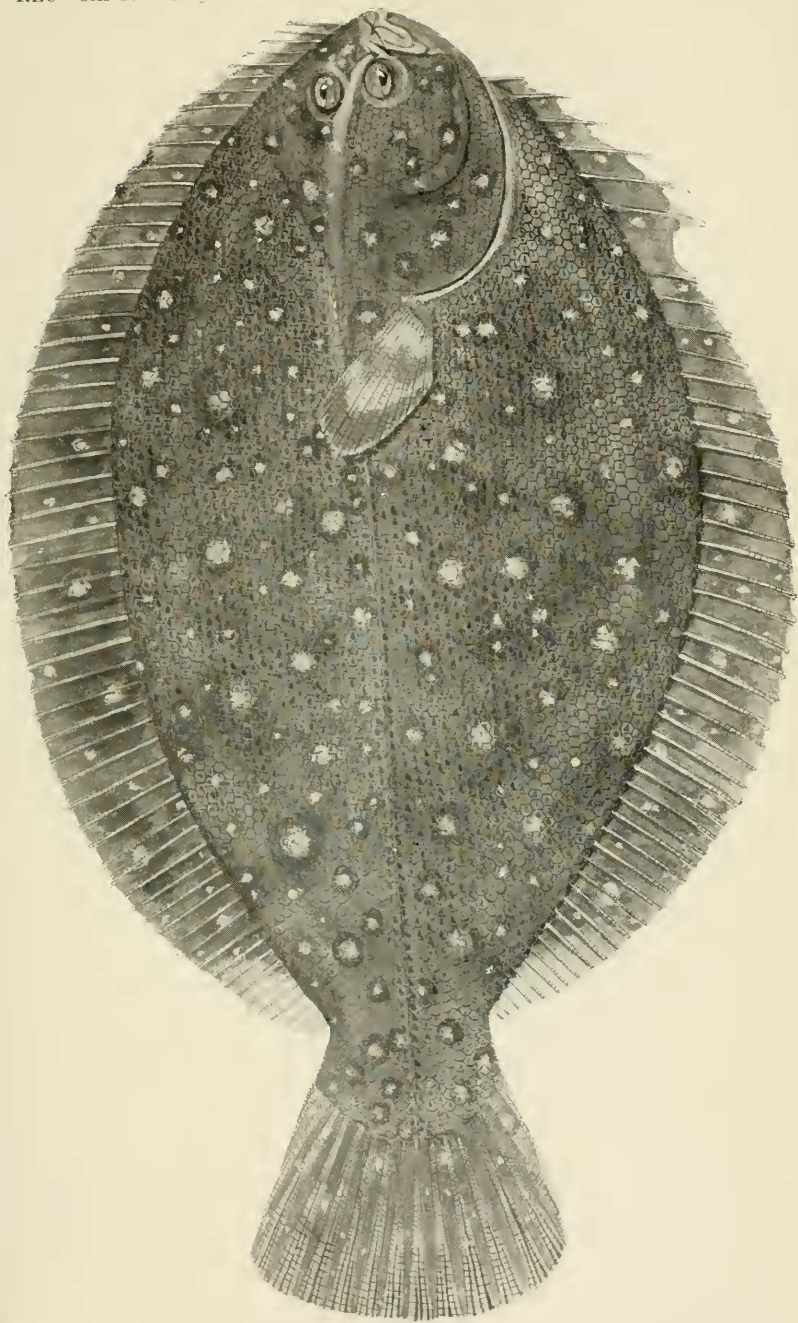


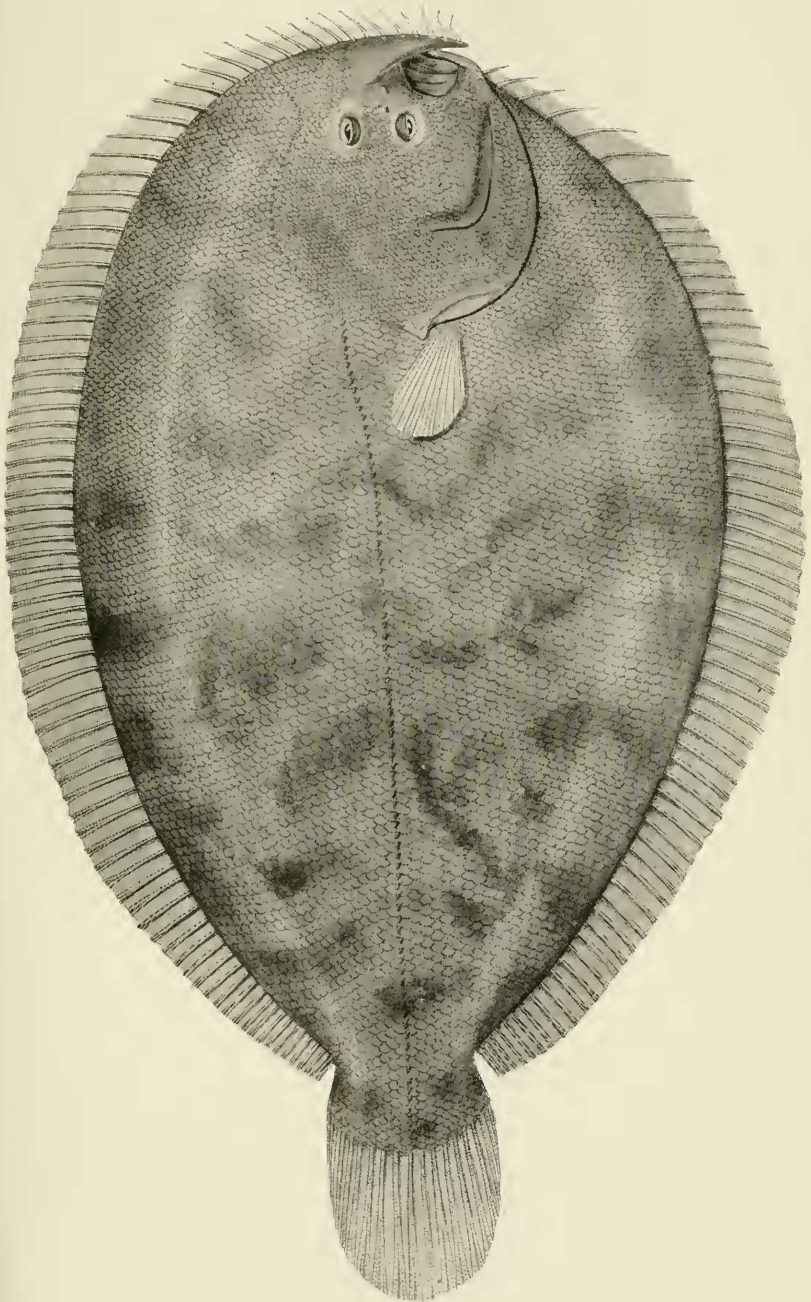


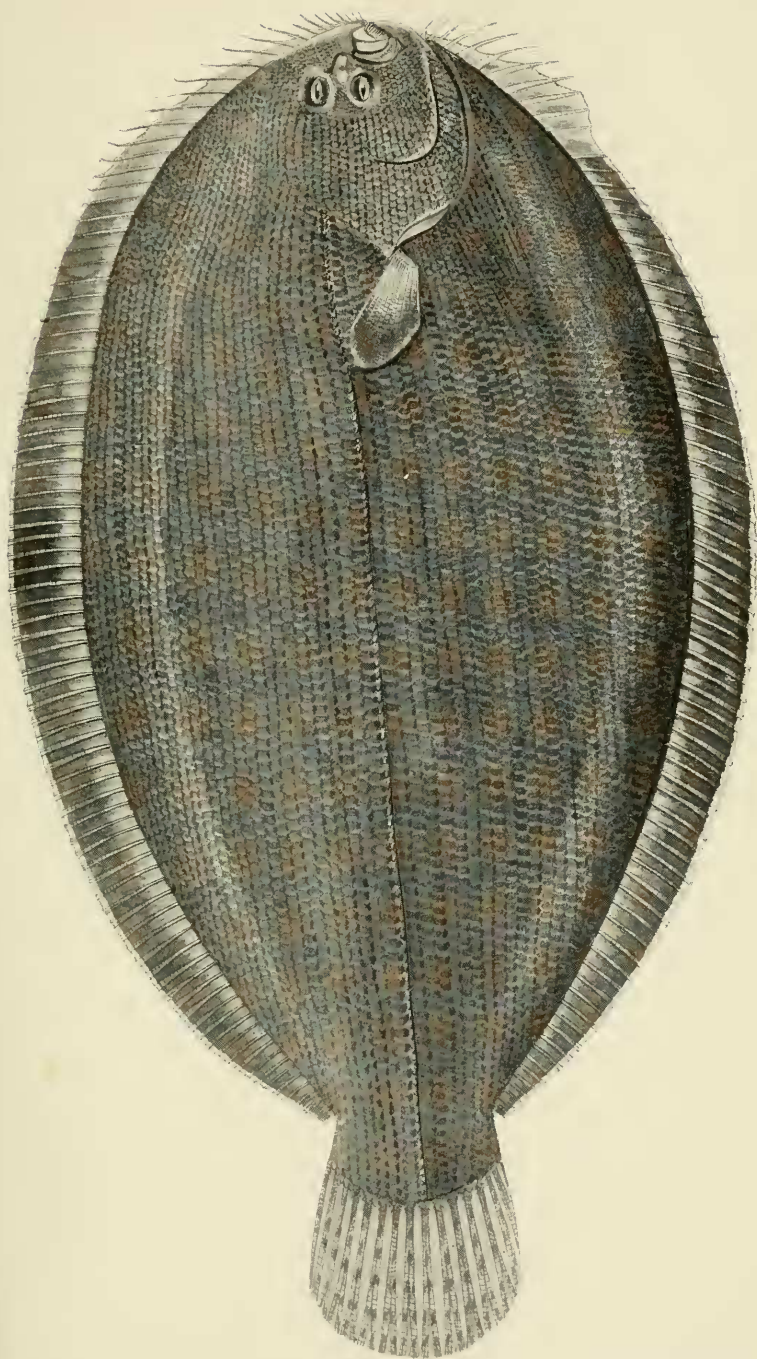


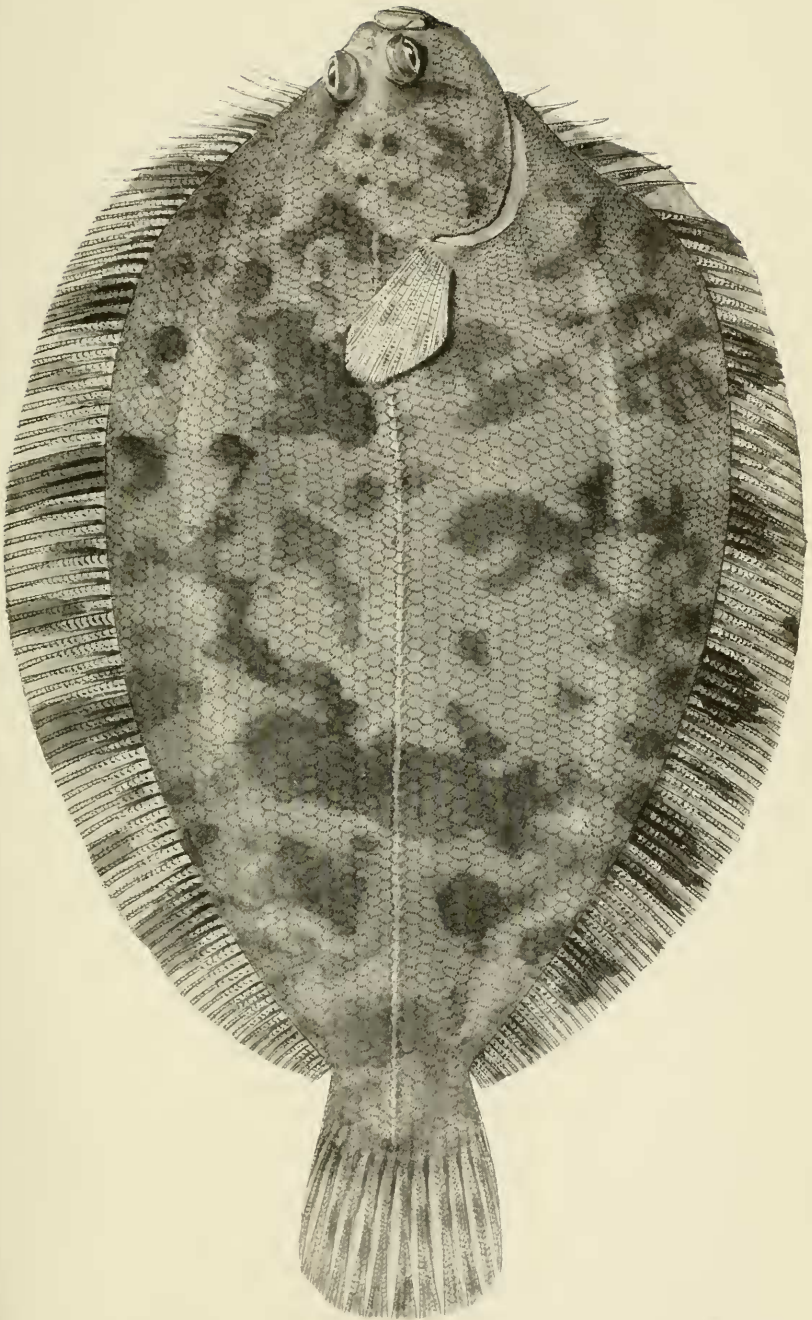


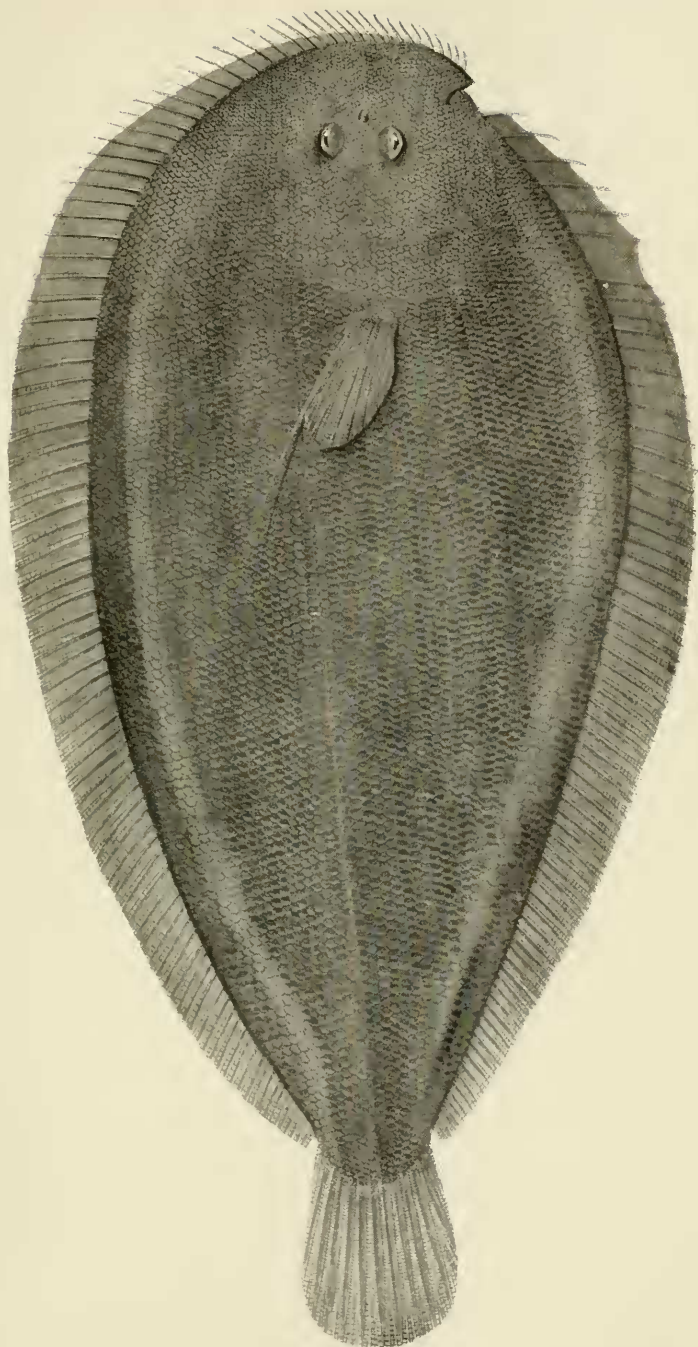


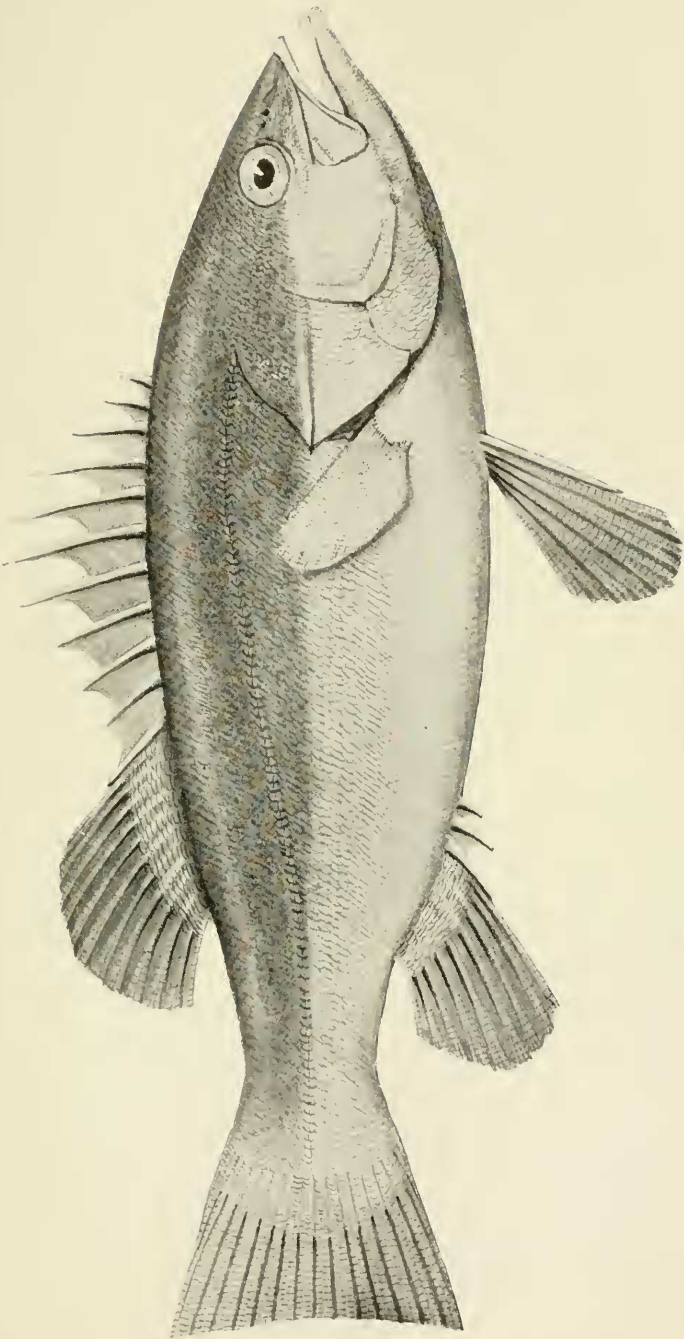




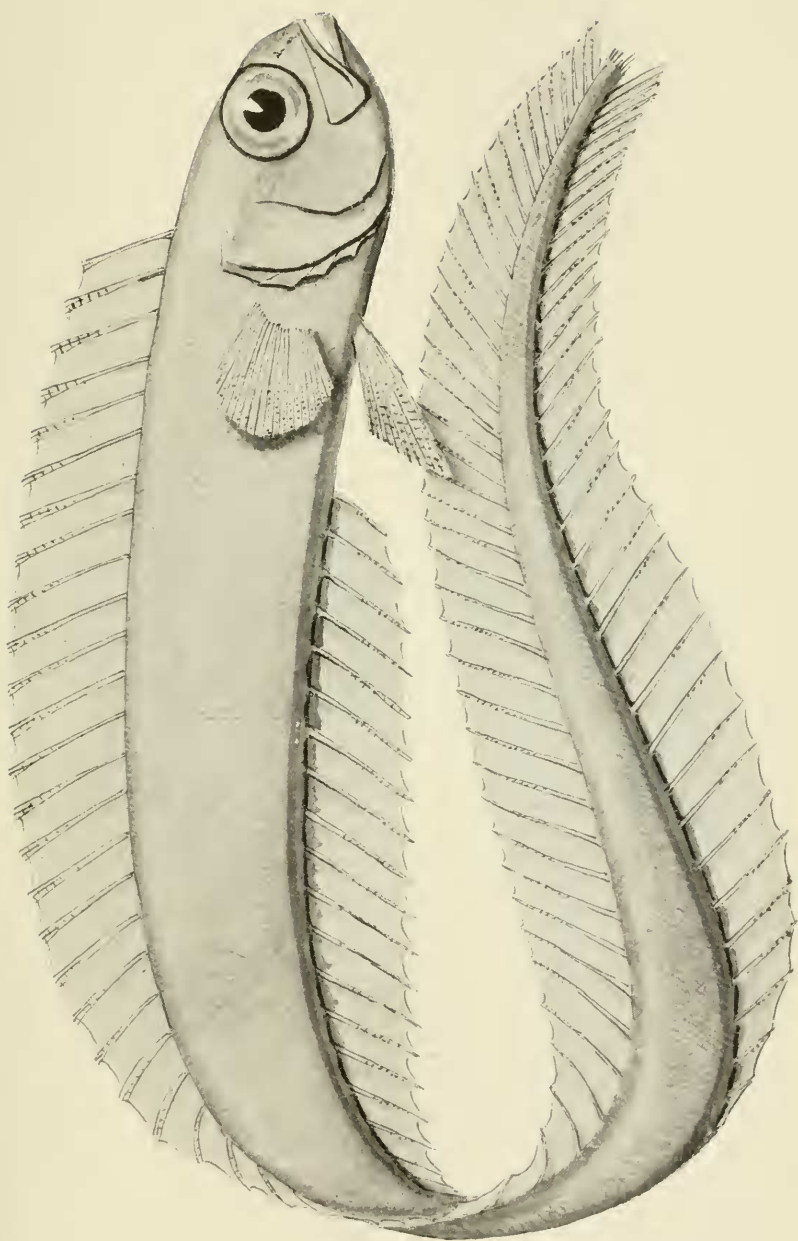


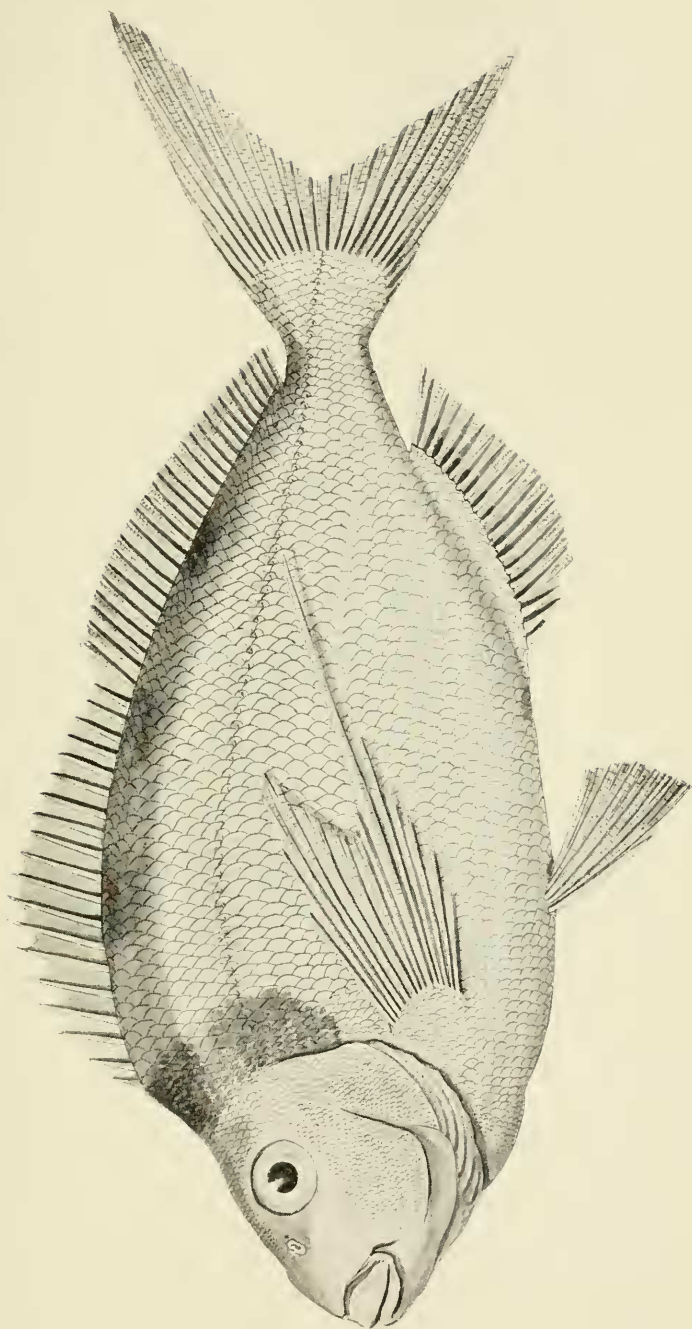


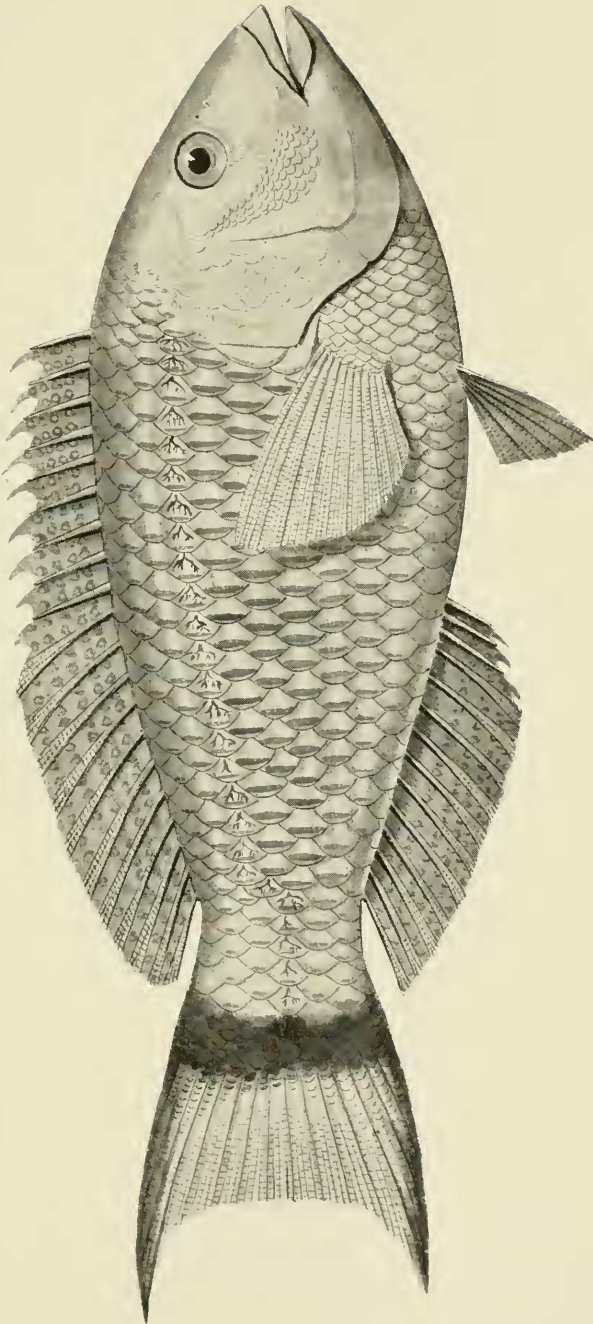


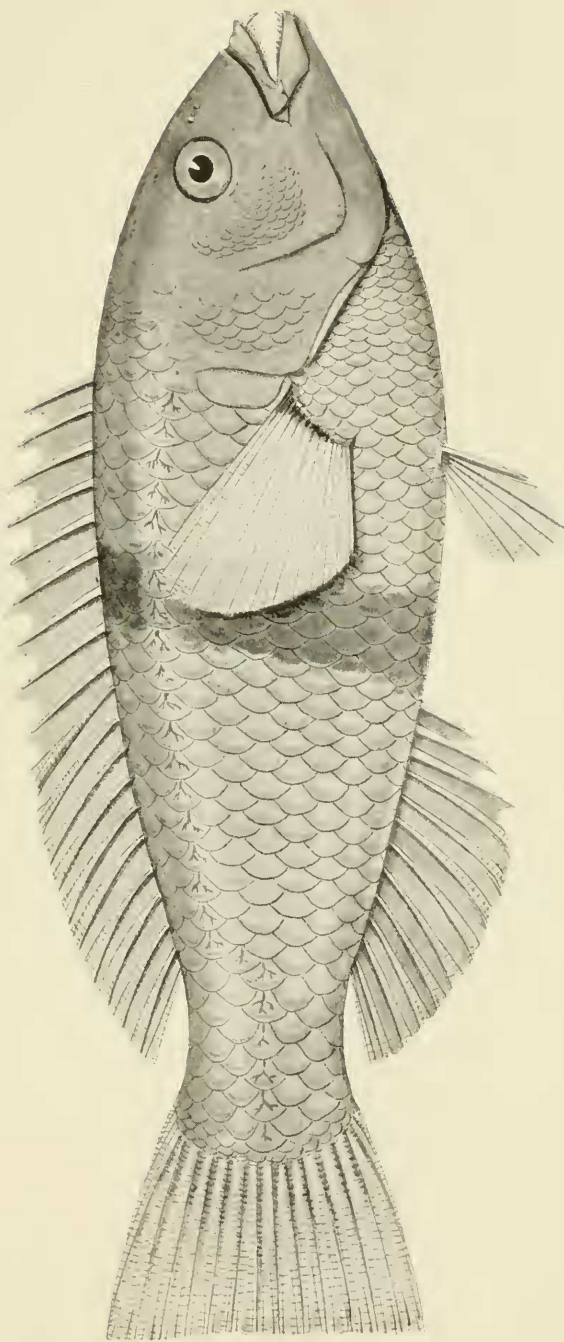


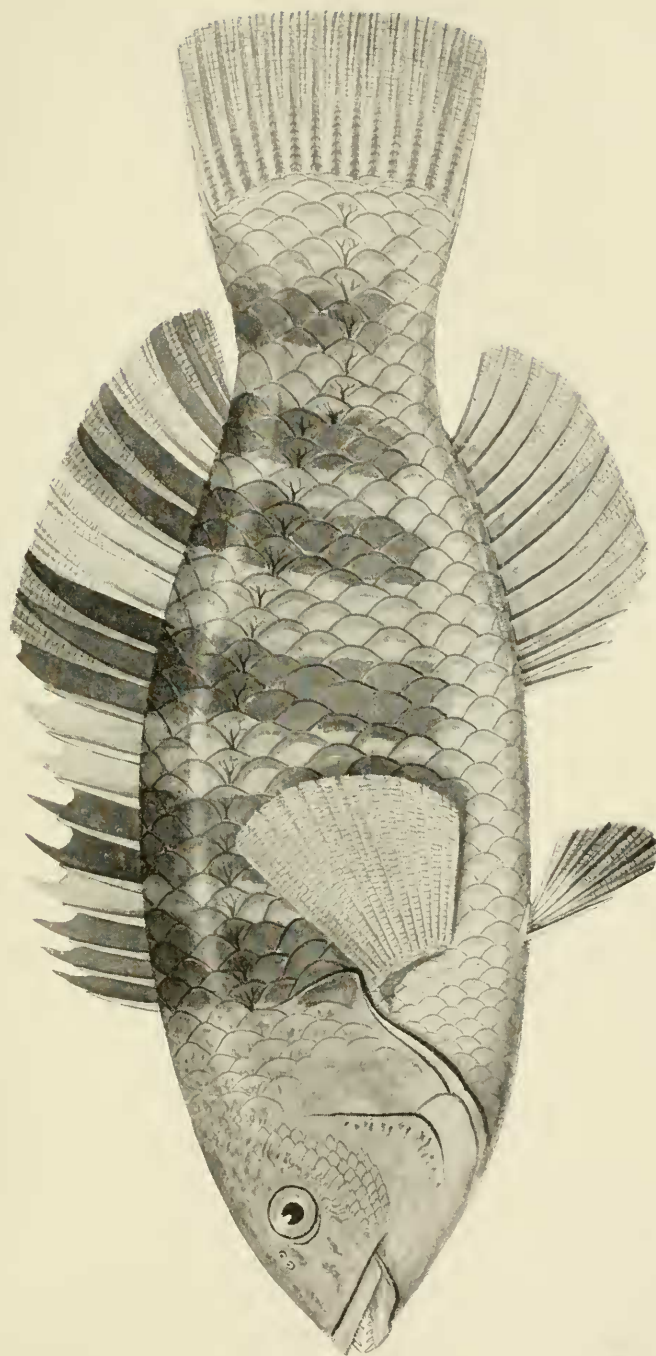
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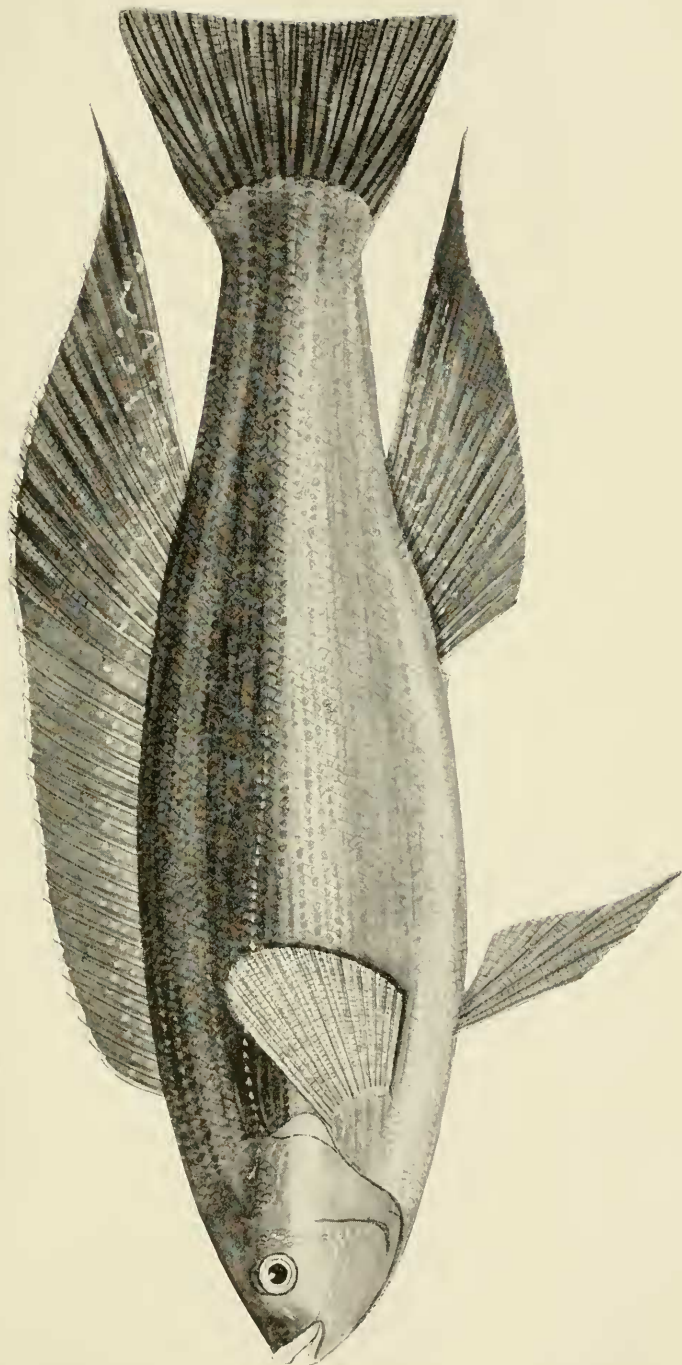


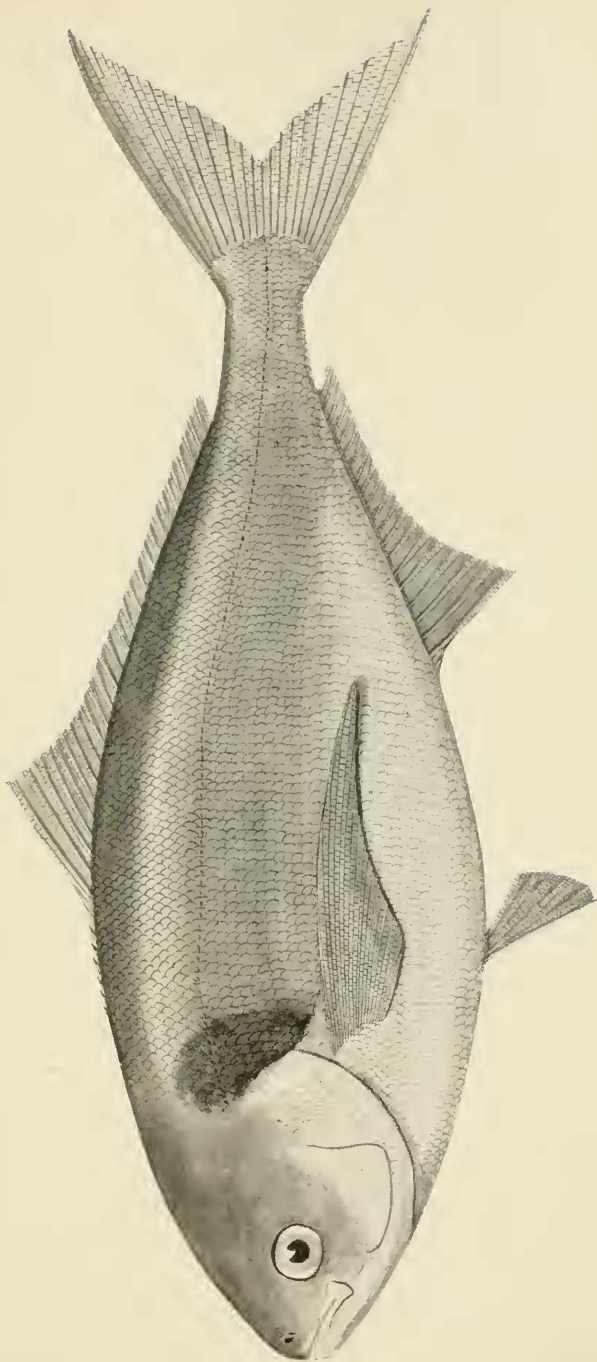


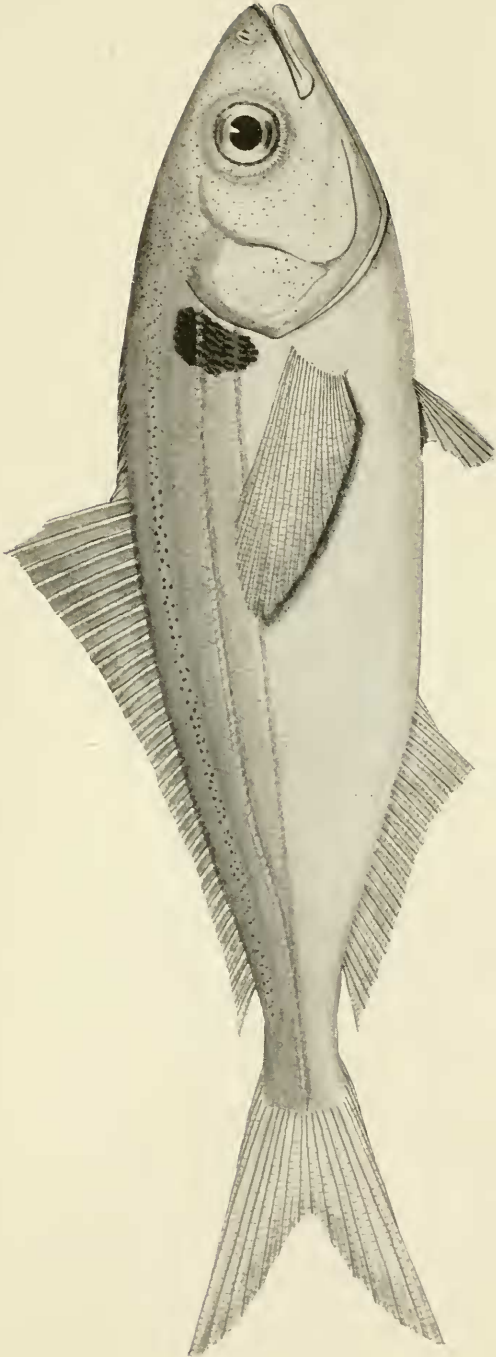


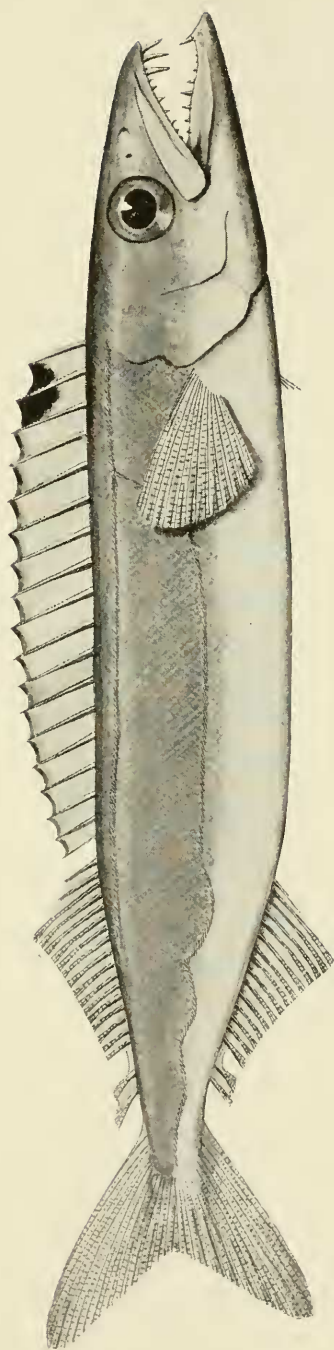


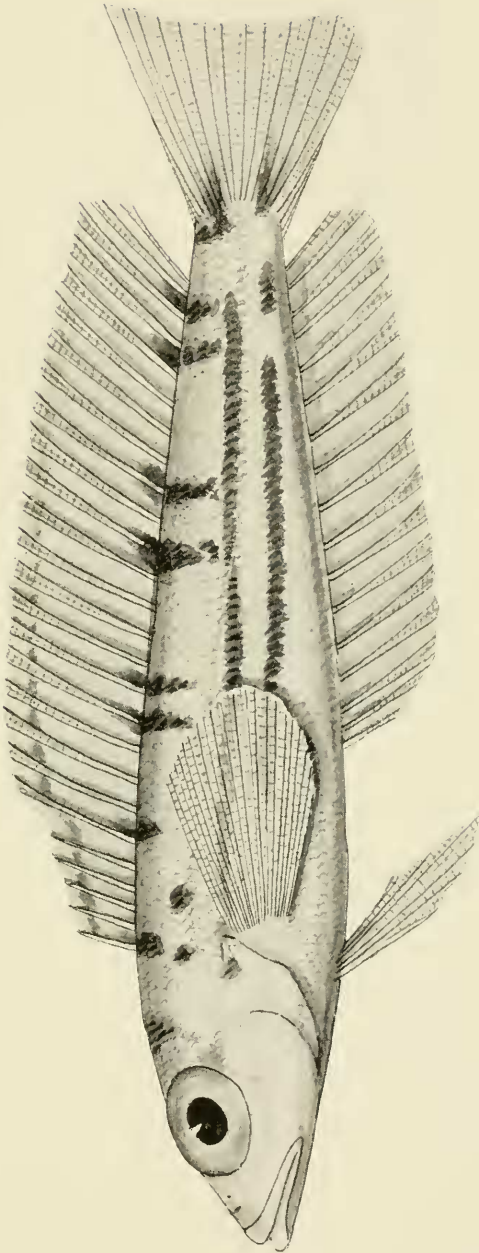


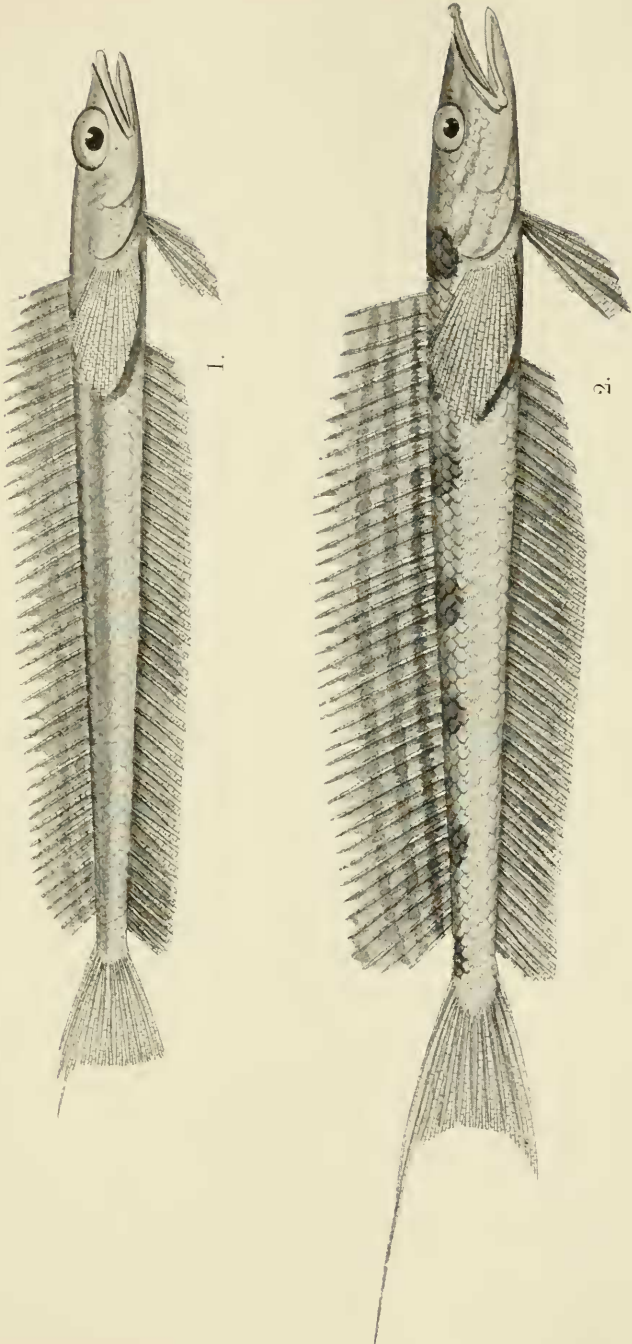


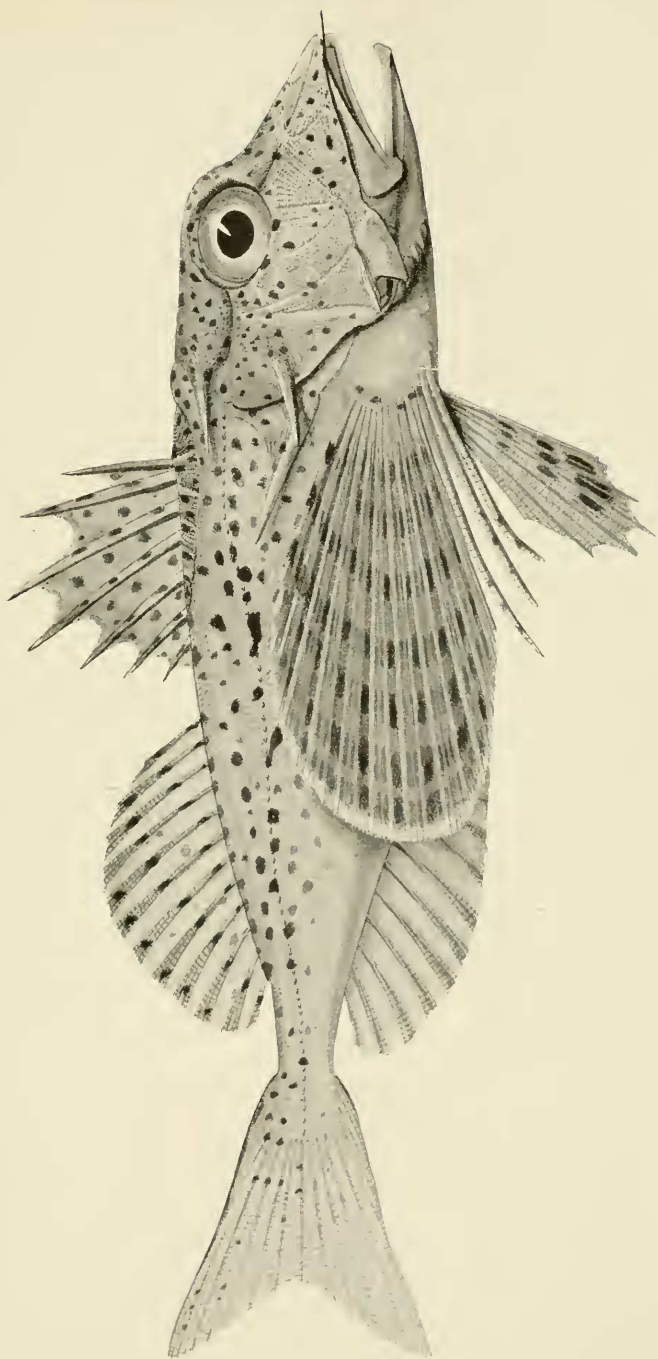


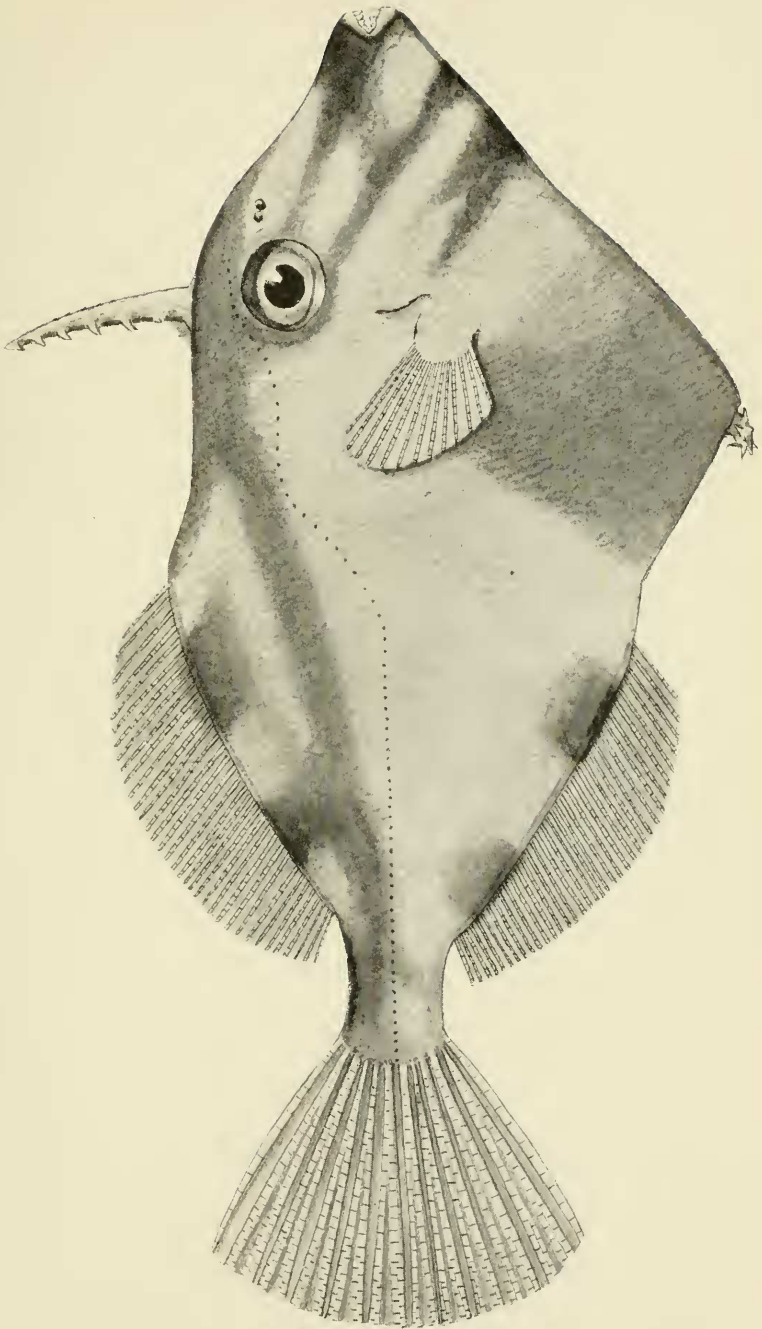












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